SCIENTIFIC AMERICAN

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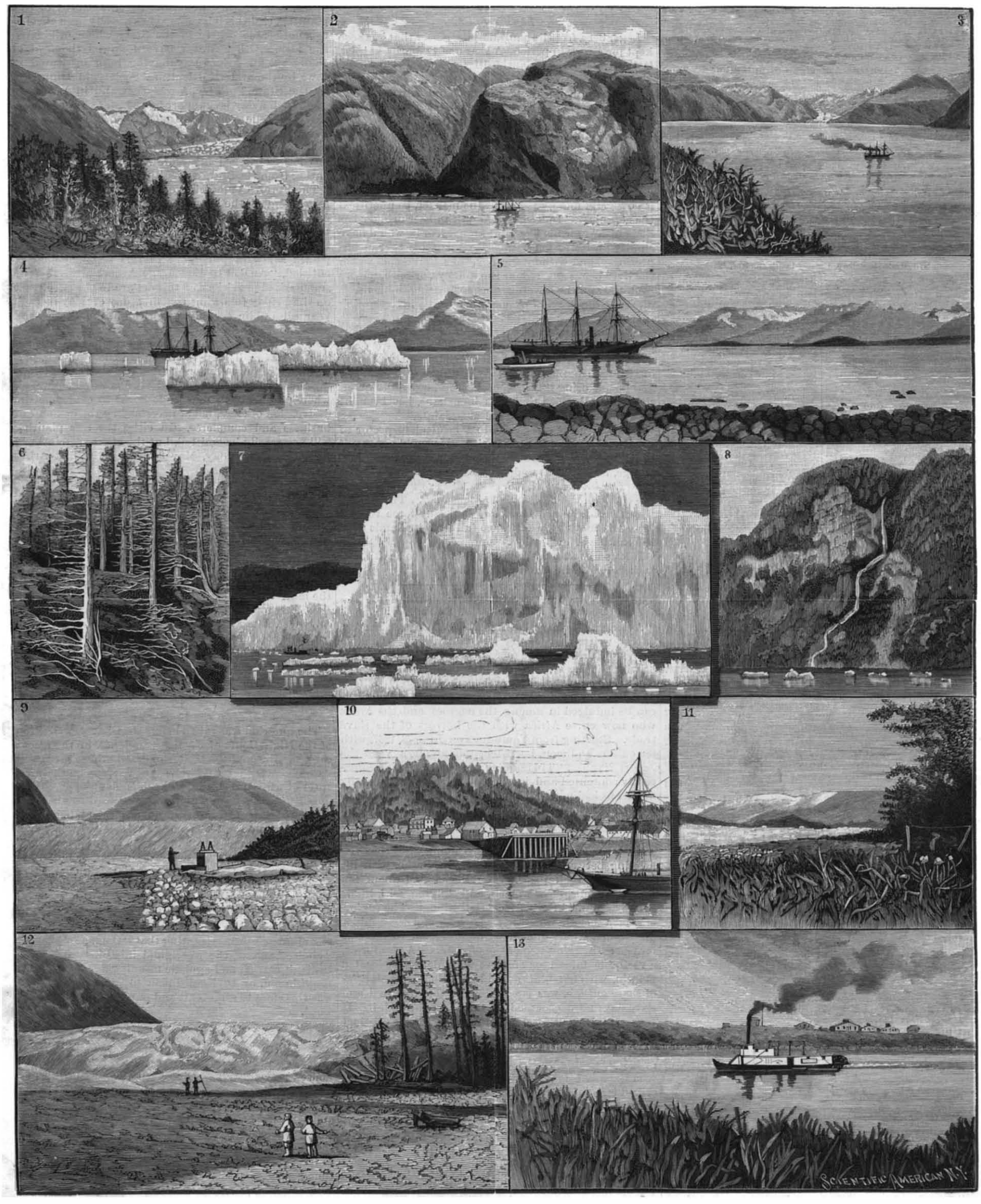

THE REMARKABLE GLACIERS, WATERFALLS, MOUNTAINS, AND HARBORS OF ALASKA.—[See page 229.]

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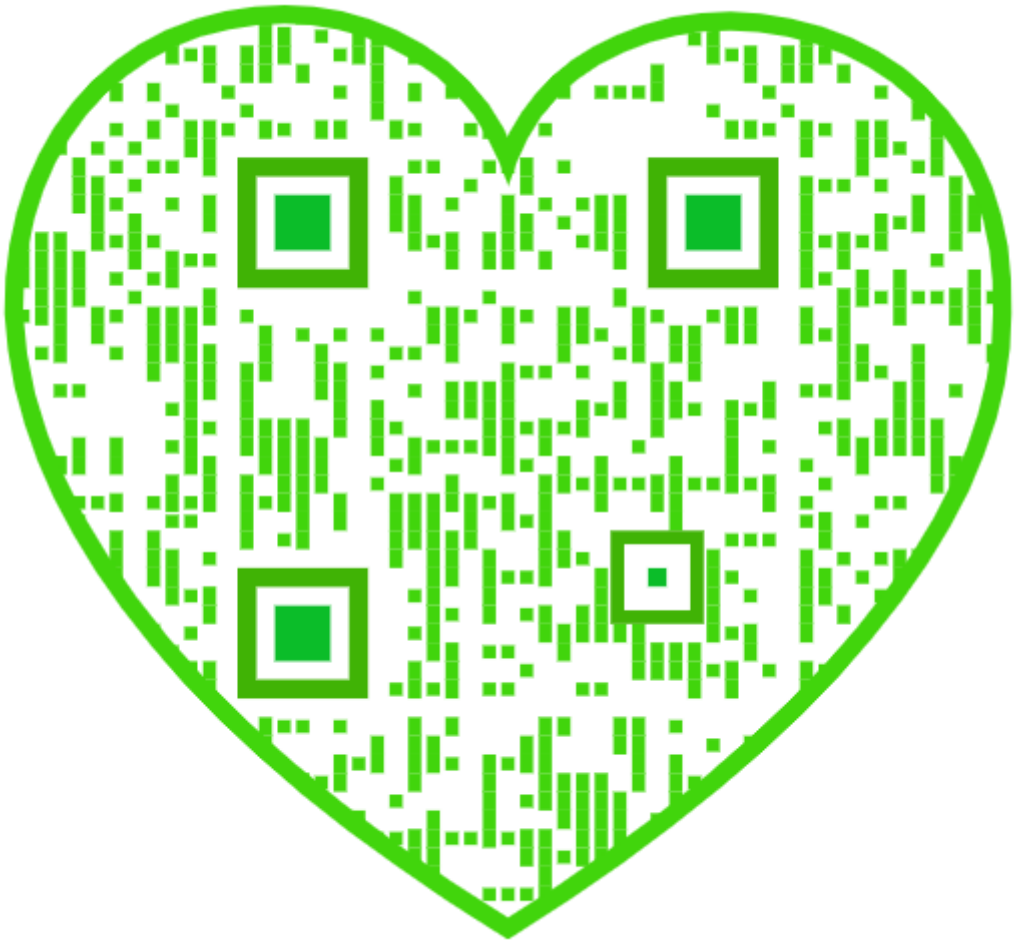

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A NEW ASSISTANT COMMISSIONER OF PATENTS.

The President has appointed Mr. Robert J. Fisher to be Assistant Commissioner of Patents. Mr. Fisher at the time of his promotion was a member of the Board of Appeals in the Patent Office, to which position he had risen from subordinate grades of official duties, all well performed. Mr. Fisher is a man of marked ability and long experience in the practical workings of the patent laws. His appointment to the assistant commissionership gives very general satisfaction among all who have dealings with the office. He will be able to render efficient aid to Commissioner Mitchell. Under the guidance of these two excellent officers, the administration of patent affairs is likely to be much improved and rendered acceptable to the public.

LAGER BEER.

Lager beer, from its name, implies a beer that has been kept for a certain period. A year or six months, at least, is the time given by authorities as that which should elapse before such beer is tapped. The German and Austrian governments impose both fine and imprisonment for any infraction of this rule, because of the deleterious effect of such drink before such lager or keeping shall have expired. There is not any such law here, and, as everybody knows who has had the time and inclination to investigate the subject, many of our brewers have greatly curtailed this time of keeping and constantly seek for expedients and processes for cutting it down still more, so eager is the market, so uncritical the consumer. Indeed, the American beer drinker has little regard for his liver and kidneys, or he would have stoutly protested long ago. He takes his beer unsuspectingly, and without inquiry, till a time comes when, the liver being affected, or the kidneys, or both, nature protests, and the beverage once so pleasing to his lips is like to so much acid. A chemist recently investigating this matter says:

"Brewers are using materials other than malted barley, such as corn and oats, etc., mixed with barley and hops, by which they accelerate its manufacture, making a sweetish, pleasing, heady beverage, but alcoholic, and people using this kind of beer in large daily quantities, with the idea that it is innocuous, has brought on a marked increase of renal complaints."

This statement was shown to a medical inspector of the Board of Health of this city. He could not say if these particular ingredients were used, but the general charge, he said, was undoubtedly true, neither colored as to the intent of the brewers nor exaggerated as to the effect on the health of the consumer. The Health Department, he said, had not sufficient force to look into this matter just now, so full were its hands with the routine of inspection.

If it can be shown the beer is injurious to health, the makers can be held and punished.

The Explorer Stanley and His Expedition for the Discovery and Relief of Emin Bey.

A long letter has been received from the heart of Africa, written by Henry M. Stanley, and serving, in its remote date and the unaccomplished crisis of affairs at which it was written, to rather excite than allay the feelings of anxiety felt for the great explorer. It tells of privations, war, and diplomacy, as far as the latter can be indulged in among the negroes and the Arabs who now curse Africa with the horrors of the slave trade. Starting from Yambunga on June 28, 1887, with 389 officers and men, he reached, in about a year, the Albert Nyanza. There he found Emin Pasha, apparently contented and in very good condition, and by no means inclined to adopt Stanley's advice and return with him *via* the Congo River. Stanley, with less than half his original forces, reached the Albert Nyanza on April 28, and saw the steamer Khedive in the distance coming to meet him. It was two hours later that the meeting between himself and Emin Pasha with his companions took place. The Pasha had about ten thousand souls, men, women, and children, with him.

The account, brief as it is, is thrilling. The explorer's men began to desert, and he found that minor punishments were unavailing and resorted to extreme measures, hanging two of the offenders. A vast forest, a veritable inland sea of trees with definitely located margin, with indentations and the other irregularities of shore outline, was encountered. One hundred and sixty days were occupied in traveling through it. It covers at least 246,000 square miles. Nine distinct languages were encountered. Near the Nyanza a great mountain, snow-capped, was seen, probably 17,000 or 18,000 feet high. He found three natives who had seen the great lake south of the Nyanza. They described is as inferior in size. The narrative stops at the point where Emin Pasha had been found. The forces under him comprised over a thousand regular soldiers, whom he described as leading a very happy life and as being probably strongly opposed to leaving. After August 28, 1888, all is uncertain.

Stanley proposed returning to Wadelai. Meanwhile Stevens is in Africa searching for Stanley, having by a bicycle journey around the world proved his fitness for such employ. Rumors of a disquieting nature have been brought, announcing Stanley's and Emin Pasha's capture, and as a reverse the news of a victory of the Pasha over the Madhi's forces. What has really happened is quite unknown, and the dark continent is silent as to the fate of her daring explorers.

Arbor Day.

The State of Nebraska was the first, in 1874, to inaugurate a movement to designate one day in a year in which every one was urged to plant a tree, or do something to encourage a general tree planting, and to that end a holiday was established, styled Arbor Day. In the almost treeless region from the Mississippi west to the Rocky Mountains it was felt that the climate might perhaps be somewhat modified, and the moisture be better kept back to promote the fertility of the farms, only by some abnormal encouragement of tree planting, and this it is claimed has already been effected to a noticeable degree in the State which originated the idea. Other States have followed the lead of Nebraska, an Arbor Day having been instituted in Iowa by the State Horticultural Society, in Minnesota by the State Forestry Association, and in West Virginia such a day is set apart by the State Superintendent of Public Schools. In Ohio, Massachusetts, and Vermont, an Arbor Day is designated by proclamation of the several Governors, and in several other States it has been observed in accordance with requests emanating from the State agricultural associations.

The Forest Commission of New York State, in 1886, recommended the establishment of such a day as an additional holiday, to be especially a school holiday, to be devoted to tree planting, tree culture, and education in forestry. The State Legislature of last year passed a law in pursuance of this recommendation, entitled, "An Act to Encourage Arboriculture." The summarized provisions of this act are to the effect that on the Friday following the first day of May in each year all public school authorities in the State shall assemble the scholars in their charge in the school building or elsewhere for the participation in such exercises as shall tend to encourage the planting, protection, and preservation of trees and shrubs. Following such exercises, trees and shrubs will be planted, where practicable. This is designed to overcome the destruction of trees, made necessary by the demand of business and commerce. In cities the tree planting will necessarily be omitted, but the other exercises will be observed. Friday, May 3, will be the first Arbor Day in this State, and Superintendent of Public Instruction Draper, in a recently issued circular, requests earnestly that there be a general observance of the day.

It is earnestly to be hoped that this subject will hereafter receive more practical attention than has hitherto been given to it. Nothing is more certain than that, as the years roll on, our children and our children's children will look upon our wastefulness in the matter of tree destruction and our improvidence in providing for new growths to take the place of trees destroyed as among the reckless and wanton follies of the present generation. It is a matter in which all can do something, and the man or child who plants one tree where it will live is surely doing something that those who come after us will have cause to be grateful for.

Trade Mark.

The question was raised before the Chancery Division of the High Court of Justice (England), in the recent case of Burgoyne *vs.* Pownall, whether the word "Oomoo" could be registered as a trade mark in respect of wine and spirits. The defendant opposed the application on the ground that the word was a colorable imitation of the mark Emu, and calculated to deceive, that the word was not "an invented word, or a word having no reference to the quality of the goods," and that it was not a fancy word in common use. It was shown that the word "Oomoo" was an adjective in the aboriginal language of Australia, signifying "choice." Mr. Justice Chitty, before whom the case was tried, permitted the registration. He said that in Great Britain the word "Oomoo" was obviously a meaningless word. Granting that "Oomoo" did mean "choice" among the aboriginal inhabitants of Australia, it carried no linguistic meaning to an ordinary Englishman, or to Englishmen in any numbers, and was therefore to all intents and purposes a meaningless word.

Fall of Black Snow.

At Aitken, Minn., on April 2, at 4:45 o'clock, it became so dark that lights were necessary in business houses, and the air was filled with snow that was as black and dirty as though it had been trampled into the earth. Six ounces of snow and one-fourth ounce of dirt and sand were found in the bottom of a dish. The dirt is very fine, something like emery, and contains particles that have a metallic luster. This dirty snow fell to the depth of half an inch. The atmosphere at the time presented a peculiar greenish tinge. There was a little wind blowing at the time from the northwest, though there seemed to be considerable wind higher in the air. Solid chunks of ice and sand are reported to have been picked up in various places.

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PHOTOGRAPHIC NOTES.

Sensitizing and Toning Plain Paper.—A veteran photographer thus describes his method, which has proved very effective :

Silver Clemon's plain salted matt surface paper with a fifty-grain solution of ammonia nitrate of silver; tone in a gold solution containing one grain of gold and sixty grains of borax in every four ounces of water; fix in a hyposulphite of soda solution containing one ounce of hypo. to every six ounces of water.

In preparing the sensitizing solution, first dissolve the nitrate of silver in the required amount of water and then pour one-tenth of it into a separate vessel, and to the other nine-tenths slowly add aqua ammonia, constantly stirring the solution untii the ammonia has redissolved the oxide of silver thus formed.

When the solution is thus cleared, that there may be no excess of ammonia, add the tenth portion previously set aside. It is now filtered, and is then ready for use. This may be regarded as the stock solution. Tbe portion required for immediate use may be placed in an ordinary drinking glass, and in applying it to the paper take a strip of gutta percha, four inches long, one and a half wide, and one-sixteenth thick. Cover about one-third of this with four thicknesses of bleached Canton flannel, and when this is thoroughly saturated in the solution, it may be used successfully in sensitizing the paper. This swab, if frequently used, may be left in the solution; but if only occasionally, it is better to wash out both it and the glass. The portion of solution remaining after use should be filtered into a bottle kept expressly for this purpose, and may be added to the stock solution required for any future occasion.

In preparing the toning solution, first dissolve fifteen grains of chloride of gold in fifteen ounces of water and then the borax in the amount of water required for immediate use; and in every three ounces of this add one ounce of the gold solution. After thoroughly stirring it, allow it to stand for a half hour or more before using it.

This bath, by being kept from the light, may be used repeatedly by simply adding half the quantity of gold solution required when first made up.

Prints thus toned will fix in the solution prescribed in from five to ten minutes, if not greatly overprinted; and when washed and mounted will present all the strength and vigor of the negatives used.

The formula, in brief, is :

Ammonia nitrate of silver	50 grains.
Water	1 ounce.
Chloride of gold	1 grain.
Pulverized borax	60 grains.
Water	4 onnces.
Hyposulphite of soda	1 onnce.
Water	6 onnces.

If Clemon's paper cannot be readily obtained, any of the brands commonly used for albumenizing may be utilized by first floating or immersing in a tepid bath containing three grains of gelatine and five grains of chloride of ammonia in each ounce of water. This paper, however, produces the best results only when freshly salted and should, therefore, be prepared only in quantities likely to be used in a month or two.

J. B. G.

Measly and Mealy Prints.—A correspondent asks what is the difference between a "measly" and "mealy" print, and what are the causes producing the same.

The appearance of a mealy print is readily recognized by its fogginess, dullness, and general lack of vigor.

A measly print has the appearance or is similar to that of the same disease in the human subject. Hence its name. It is most noticeable by looking through the print. These spots appear to exist chiefly in the texture of the paper, and so ingrained are they that they may be regarded as almost incurable. Perhaps the best means of avoiding them is by floating the back of the paper immediately after sensitizing and blotting off the surplus with acetic acid one ounce, water sixty ounces.

The terms mealy and measly are not synonyms as used in photography, and the remedies to be applied in curing or preventing mealiness are not always *apropos* in cases of measley prints. A mealy print may be caused by the manner in which the paper is albumenized or by the condition of the albumen, and though by skillful handling on the part of the photographer, it is much safer to exchange it for a better quality. In determining whether the fault is in the paper or is due to some other cause, it is only necessary to float it on a test bath containing forty grains of nitrate of silver and twenty grains of fused nitrate of ammonia dissolved in each ounce of water. If in silvering the paper on this bath there is any perceptible change after drying and fuming it, the fault is in the paper, and it should be thrown aside. Mealiness, however, may occur with good paper when the silvering solution is very alkaline, or where there is too little silver to coagulate the albumen. Uuder such circumstances the solution penetrates through the back of the paper, and is very likely to discolor in a very few hours. A very strong and rapid toning bath will sometimes produce a mealy effect and destroy the brilliancy and force of the finished print. But in any case, whether the mealiness comes from the paper, from an alkaline or very weak bath, or from rapid toning, it may soon be learned and recognized by an observing and practiced eye, and so disposed of with but little loss of time and trouble.

J. B. G.

Plating with Aluminum.

BY L. Q. BRIN, PARIS.

The process which constitutes this invention is intended for depositing a coat of aluminum upon a metallic surface by the direct contact of a volatilized salt of aluminum with the surface. The sheets of iron or other metal are first of all cleansed from all impurities by an acid bath, and they are afterward plunged into a solution of borate of soda, hydrated alumina, and some easily fusible flux, so that the surfaces shall be preserved in a state of perfect cleanliness. The articles which have been treated in this manner are placed within a closed muffle, and the walls of the muffle are heated to a very high temperature by a surrounding furnace. There are openings in the sides of the muffle to provide for the entrance of the vapors, and for the escape of the gases resulting from their decomposition. Some salt of aluminum, such as the chloride, is heated in a vessel of fire clay to the temperature of volatilization, and it is then conducted through the muffle in direct contact with the surfaces of the plates. The aluminum is at once separated, and it is deposited upon the metallic surface. A current of inert gas, such as nitrogen, is forced through the retort and muffle along with the stream of aluminiferous vapor, so that no oxidation shall be possible. The outlet tube from the muffle conducts the residual gases into a receiver, upon whose condensing surfaces the sublimated vapors are deposited for further utilization as by-products. In this operation of plating it has been found by the inventor that the metallic sheets are not only covered with a coating of aluminum, but that they become impregnated with it to such an extent that it may be considered that they are composed of an alloy of the two metals.

The American Pomological Society.

The late meeting of the American Pomological Society was held in Ocala in accordance with the invitation of the Florida Horticultural Society, and the Northern visitors were impressed by the energy and intelligence shown by the members of this organization. It was natural that a large percentage of the papers should have been contributed by them and that they should have conducted most of the discussions. But the uniform excellence of the addresses was noteworthy. Nearly two hundred members of the local society were present, and their activity suggested the thought that the large percentage of the population engaged in fruit culture helped to insure a more general familiarity with the methods which command success than can be found in regions where fruit culture is subordinate to other branches of horticulture and agriculture.

President Berckmans, in his opening address, said that the Pomological Society was founded fifty years ago, not only to unite the fruit growers of the country in a brotherhood and furnish a means of social intercourse among them, but to be of practical utility in collecting and classifying the knowledge of different fruits gained in widely separated localities.

The committee on subtropical fruits, which was created at the Boston meeting of the society, proved its value by presenting a report which gave a better account of the history and importance of this strictly Southern industry than can be found elsewhere in the same compass.

In Louisiana the parish of Lower Placquemines has the advantage of furnishing the earliest oranges. The entire crop is sold on the trees, and the oranges are often paid for while the trees are yet in bloom. The prospective crop of a hundred acre orange grove was sold last winter for $30,000 before a blossom or bud had appeared on the trees. In southern Alabama the hopes of orange growers were frozen out with the death of the trees in the cold January of 1886, but the fig is here grown to perfection, and yields enormously. No other strictly subtropical fruits are grown here, but, as in the northern region of Florida, fruits of Oriental origin, like the Kelsey and Bhotan blood plums, the peen-to and honey peaches, the Le Conte and Keiffer pears, are receiving much attention. There is a reviving interest, too, in some old and almost extinct varieties of the peach, while the cultivation of the Scuppernong grape and of the pecan is rapidly growing in commercial importance.

In the Florida peninsula proper, and down to the twenty-eighth degree of latitude, the cultivation of the citrus fruits is the absorbing industry. The trees here grow like weeds, attaining the largest size and most perfect development. Every known variety of orange seems at home here, and many of the introduced kinds attain a sprightliness of flavor, combined with a juiciness and sweetness, which they never acquire in their original habitat. It is but reasonable to expect that in countries where these fruits have been cultivated for centuries, varieties of the finest texture and flavor may be looked for, and enterprising Floridians are collecting and experimenting with the best oranges wherever they can be found. On the other hand, many persons hold that the best fruits can be had by selecting choice seedlings at home, which unite good quality with great productiveness. Many of the best known groves in the Indian River region are from Florida seedlings, and even the famous Navel trees, on account of their unfruitfulness, have in some cases been budded with so-called native varieties.

The lemon is more tender than the orange, but the freezing weather three years ago did not cause irreparable loss in the southern counties, and largely increased areas are planted with this fruit every year.

Many persons consider it the most promising for cultivation of all the orange family. Florida lemons were quite unsalable a few years ago, but now, since more has been learned of varieties and of proper methods of curing and harvesting, they lead the market in value.

The pomelo, or grape fruit, has conquered a position for itself in the North, and must soon be as popular in the market as it always has been for home use. Its beauty and size and flavor must make it salable, and its productiveness will make it profitable. It varies greatly, and new and improved varieties will certainly be produced.

The best varieties of the lime have been so lately introduced that little is yet known of their commercial value. Besides these, many minor fruits of this family have been introduced and are sparingly used in a domestic way, like the citron, the shaddock, and the kumquat, a diminutive Japan orange of great value for preserving.

The fig has already been mentioned, but it thrives best north of the orange belt. The loquat, or Japan medlar, is seen growing over all the State, and has proved profitable where planted for market. It is susceptible of great improvement, and the better varieties can be grafted on seedlings or on quince roots, as is done in California. The kaki, or Japan persimmon, is a comparatively recent introduction. Some of its varieties are so rich in color that they may be fairly termed gorgeous, and in flavor it bears as high a rank as it does in appearance. No doubt its introduction marks an era in the history of fruit-growing in the State, for its culture is no longer an experiment. Still, comparatively little is known as yet of its distinct varieties or their special uses. One of the most interesting fields of experiment now offered to horticulture is the hybridizing of the kaki and the American persimmon. In the orange belt the hardier varieties of the guava, the olive, the date, the carob, the downy myrtle, the Chinese litchi, and other fruits have been successfully grown, while south of this region the custard apple, the tamarind, the tropical almond (*Terminalia Catappa*), the pineapple, the hog plum (*Spondia*), the Barbadoes gooseberry (*Peireskea aculeata*), the star apple (*Chrysophyllum Cainito*), the mango, together with the banana and cocoanut, are all in cultivation, and described with some detail in the report.—*Garden and Forest.*

Bent Wood Furniture.

The material to be bent, as practiced in Austria, is usually the red beecb, a product of the Hungarian forests. In the United States the common beech and birch are used and stained with the aniline reds modified by logwood and Brazil-wood. The timber is sawed into strips of the proper size and finished in a gauge lathe or by hand to the required proportions.

They are then placed in a tight case of wood or iron, and subjected to a steaming process for a few minutes, and in work requiring specially sharp bends the last steam is superheated slightly or the goods put under high pressure steam in an iron case with sealed door, capable of 50 lb. pressure. This makes the wood very pliable.

Moulds of wood or iron are used of the exact shapes, into which the hot strips are bound at the moment of removal from the steam case. In from two to eight days the strips are set and dry, ready for assembling, finishing, and varnishing.

Teak Wood.

So indestructible by wear or decay is the African teak wood that vessels built of it have lasted fully one hundred years, to be then broken up only on account of their antique mould or defective sailing qualities.

This wood is one of the most remarkable employed in the human industries, for its great weight, hardness, and durability, its weight varying from 42 to 52 pounds per cubic foot. It works easily, but from the large quantity of silex contained, the tools for working require to be hard, and even then are subject to severe wear. It also contains an oil which prevents the iron spikes and nails driven into it from rusting.

The East Indian teak wood is somewhat lighter and easier worked, and also from its silicious qualities a perfect germicide to marine life, so destructive to other woods. It requires from sixty to eighty years for growth sufficient for shipbuilding purposes. It is largely in use in English shipbuilding.

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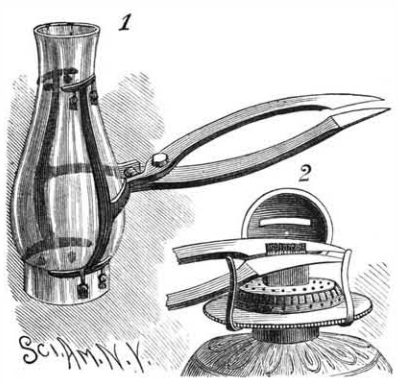
IMPROVED TONGS FOR LAMP CHIMNEYS, ETC.

The illustration herewith represents a recently patented invention of Mr. John T. Evans, of Minersville, Utah Ter. The device consists of tongs in which a spring is inserted near the pivot to press apart the outer ends, these ends being curved outwardly and supporting upright arms, on the upper and lower ends of which are slightly curved cross pieces. Cords or bands of a soft material are wound upon these cross pieces, to prevent the breaking of a chimney or fountain of a lamp they are adapted to seize. On the rear of the handle ends of the tongs are formed knife blades, by which the device is adapted for the trimming of wicks and other purposes.



EVANS' TONGS.

Inventors, Take Courage.

A bill is before the United States Senate authorizing the Committee on Patents to sit during the recess of the Senate, to inquire into the condition of the present system of issuing patents and the cause of delay in granting the same. It is to be hoped that the measure will receive its sanction, and that the committee will enter upon their task of investigation vigorously, and we are quite sure they will discover the necessity of recommending an increase of appropriation for the Patent Office to enable the Commissioner to increase his clerical force and keep the work of the office well up.

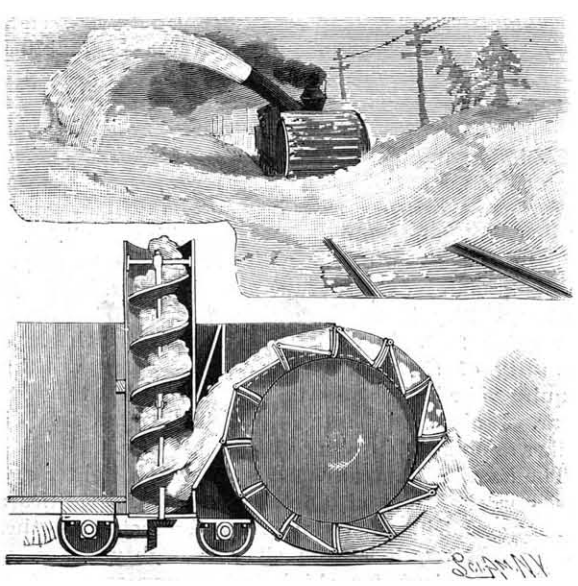
AN IMPROVED BASKET OR CARRIER.

A simply made basket or "carrier," of a construction also suitable for the manufacture of light barrels and other receptacles, is illustrated herewith, and has been patented by Mr. Isaac J. W. Adams, of Adams & Co., Laurel, Del. It has inner and outer slats oppositely inclined, so that the two series cross each other, the slats being held together by hoops at their ends and middle portions, while nails or other fastenings are driven through the slats and hoops from the inside and clinched at their points. A small inner hoop is placed near the bottom as a support for the bottom board, the latter being also held by nails passed through the lower outer hoop and slats. A hoop is likewise placed on the inside at the upper end.

ADAMS' BASKET OR CARRIER.

AN IMPROVED SNOW PLOW.

The illustration herewith represents a snow plow designed to remove the snow from a railroad track and force it to quite a distance to one side, leaving a solid and compact wall at each side. It is a patented invention of Mr. Oren Williams, of Gouverneur, N. Y. The body of the plow is made similar to a box car, and adapted to receive an engine to operate the plow, which is pushed forward by a locomotive in the usual way. From each side of the box body arms are forwardly projected, between which is mounted a drum wheel divided into a series of pockets by transverse semicircular partitions extending from end to end of the drum. In front of each of the partitions a radial slot is produced, the center of the circle of the slots being immediately above the partitions, at which point the upper ends of discharge plates are pivoted, one plate for each pocket. A trip plate is rigidly attached to the inner face of each of the frame arms, having a cam face, indicated by dotted lines, whereby the discharge plates are held in open position to allow the pockets to be filled with snow as the pockets are ascending on the forward side of the wheel, while these plates assume a position to push the snow out of the pockets into the hopper at the rear during the further progress of the wheel. Between the drum wheel and the box body is an essentially T-shaped tubular casing, its horizontal member constituting the base, and in this horizontal member are two screw conveyers, one with a right hand and the other with a left hand pitch, a short vertical conveyer being centrally journaled in the casing. To the upper end of the vertical conveyer a second conveyer is hinged, the latter projecting upward within an inclined portion of the casing. The upper vertical and connected inclined conveyers are adapted to be revolved at least once and a half or twice as fast as the two lower or horizontal conveyers. A hopper is attached to the forward end of the T-shaped tubular casing, and extends from side to side of the main frame of the plow, communicating with the horizontal and vertical portions of the casing, the forward end of the hopper being open and facing the wheel. The snow is continuonsly delivered, as the plow is operated, from the several pockets of the wheel into the hopper and upon the horizontal conveyers, the latter continually forcing it from the sides upon the vertical conveyer, by which it is thrown to a distance from the track at one side.



WILLIAMS' SNOW PLOW.

The Cocoanut Crab.

On the Agala Islands, in the Indian Ocean, there is a very strange crab. He is known to science as the *Birgus lutro*, or thief crab, and his depredations are carried on in the cocoanut groves which abound on these islands. This crab grows to be twenty-two inches long, measuring from the tip of the tail to the end of the long claw, and resembles in general appearance the hermit crab. The abdomen is fleshy and not covered with a shell, and in order to protect this it is the habit of the thief crab to take forcible possession of a shell of the Trochas family, in which it lives. It is nocturnal in its operations, and has the faculty of selecting the trees having the finest cocoanuts upon them. Climbing up the trunks frequently for twenty-five feet, it reaches the limbs and severs the stems which attach the nuts to the branches. These are frequently as thick as your three fingers, and would require a strong knife to cut them. Having brought down the nut, the crab now descends to the ground, digs a hole and rolls the cocoanut into it.

He then commences to tear off the husk, fiber by fiber, until the nut is completely exposed, and then breaking in what is known as the eye he eats the meat completely out. The fibers stripped off the cocoanut by this crab will frequently fill a bushel basket, and they are gathered for making mattresses, and are also twisted into ropes. Cocoanut groves are cultivated by those who make a business of extracting the oil from the nuts to be used for illuminating purposes, and the depredations of this crab are of a very serious character, in many cases the efforts of the natives to exterminate them proving fruitless. CHAS. D. BAKER.

Treatment of Rifle Barrels to Prevent them from Becoming Crooked while Firing.

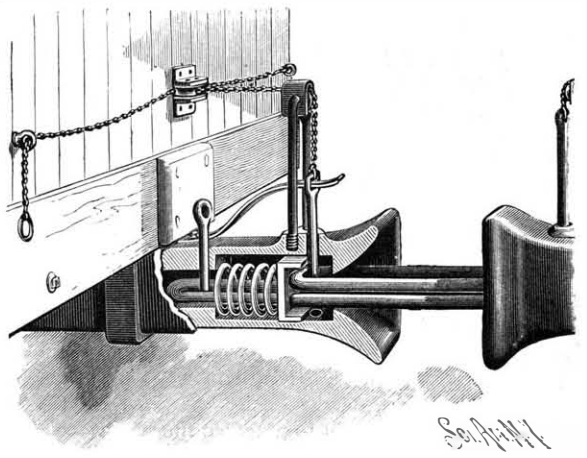
BY H. S. MAXIM.

The gun barrel having been finished in the ordinary manner is mounted in a lathe so that both its external and internal surfaces run true. A current of carbureted hydrogen gas is then passed through the bore, and at the same time a series of gas jets are applied to the external surface of the barrel. As the barrel becomes heated it runs out of truth, and this is corrected from time to time by straightening it by means of levers or mallets, or otherwise, while it is in the lathe and while hot. The barrel thus treated is not liable to become crooked while firing. The current of gas passing through the bore prevents damage to the gun by oxidation during the straightening operation.

THE official test of the Bell Telephone Company's long distance telephone system was made February 16, between Buffalo, New York, Albany, and intermediate points. A local newspaper says: A conversation with the metropolis was carried on most successfully. The line worked entirely free from induction, and the distinctness with which the voice could be heard at so great a distance was surprising. Conversations with Boston, Syracuse, and other points were carried on successfully. The company have fitted up their rooms at 14 West Seneca Street with thirteen compartments for the convenience of patrons, who can thus carry on conversations in strict privacy.

AN IMPROVED CAR COUPLING.

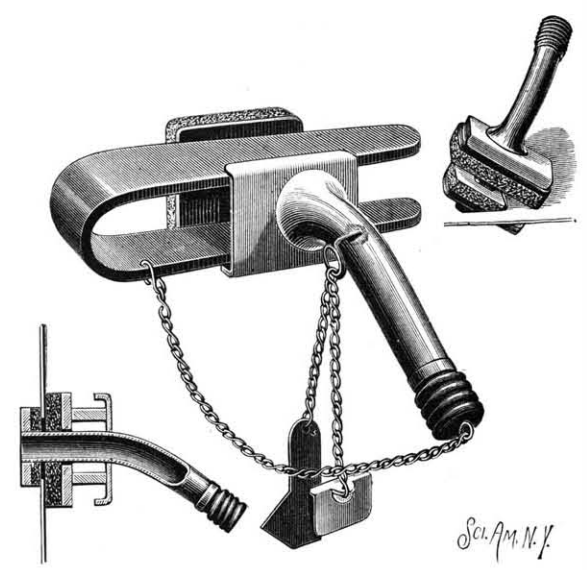
The car coupling herewith illustrated has been patented by Mr. John Clarridge, Sr., of Libertyville, Iowa. The rear of the drawbar chamber in which the link is held, surrounded by a spiral spring, has an abutment against which the spring strikes, shoulders limiting the forward motion of a follower pressed outward by the spring, and one link being permanently retained in place by a pin passing through a vertical aperture at the rear. The follower, when the coupling is ready to be connected with another coupling, is held in its outermost position, and then forms a support for a coupling pin held in a vertical aperture in the drawhead. To the coupling pin is attached a chain extending upward and through two pulleys to either side of the car, within convenient reach of the train men, whereby cars may be uncoupled without going between them. A spring passing through a suitable opening in the top of the coupling pin is adapted to force the pin down when the entering link of an approaching car enters the drawhead and pushes back the follower.



CLARRIDGE'S CAR COUPLING.

AN IMPROVED SPOUT CONNECTION FOR CANS, ETC.

An attachable spout especially adapted for use with the tin and thin metal vessels of commerce, without the use of solder, and which can be readily removed when the vessel is empty, is shown in the accompanying illustration. It has been patented by Mr. Ernest W. Vacher, of Moore's Station, Texas. The outer end of the spout is adapted to receive a screw cap, and around its inner end is secured an oblong rectangular metal plate, the spout fitting in near one end of this plate, which is lined with felt on the side that is to come next the inner wall of the vessel. A similar metal plate is fitted to slide on the spout just outside the can, this plate being faced with felt on the side next the outer wall of the vessel. Beyond this sliding plate the spout is provided with a shoulder and corresponding fixed plate, these two plates being slightly inclined so that a wedge inserted between them, when the inner end of the spout with its plate has been inserted in the can, will press the felt-faced sliding plate close to the outer wall of the can, at the same time that the plate, lined with felt on the inner end of the spout, is drawn against its inner wall, thus making a thoroughly tight joint. To insert the spout in the can, a small cutter and pattern are used, these being attached to the spout by light chains. A hole of just sufficient size having been made, the aperture is pried open sufficiently to insert one end of the plate fixed on the inner end of the spout, which is then pressed completely down through the aperture. The device is then turned one-quarter around and the plate pressed up against the inner side of the aperture, when the sliding plate is pressed against its outer edge, and the wedge inserted and driven tight. The construction of the device is extremely simple, making an article which can be sold at a low price, while an absolutely tight joint is made on the thinnest metal.



VACHER'S ATTACHABLE CAN SPOUT.

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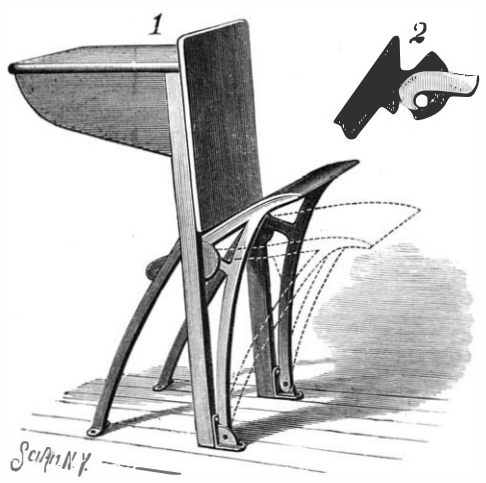
AN IMPROVED SCHOOL DESK AND SEAT.

The combined desk and seat shown herewith has been patented Mr. Gustavus Hamel, of De Soto, Mo. The desk is supported by two corner legs or standards, slightly inclined, an inclined brace bar being secured at its upper end to each leg and at its lower end to the

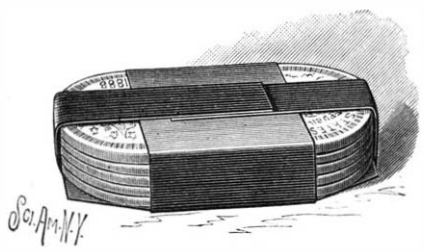


HAMEL'S SCHOOL DESK AND SEAT.

floor. The upper end of each brace projects slightly to the front of the standard, and carries an inwardly extending pin, preferably covered by rubber. When the seat is in a horizontal position, as shown in dotted lines, this pin is engaged by a hook on the horizontal arm of the seat bracket, as shown in Fig. 2, the bracket having another arm fulcrumed to the angle iron at the base of the desk standard. A connecting bar between the two arms of the bracket serves as a stop when the seat is folded up, these bars then striking against the pins to limit the rearward swinging motion of the seat brackets. The pins being covered with rubber or other soft material, noise is prevented in folding up or closing the seat.

AN IMPROVED COIN PACKAGE.

A coin package, to be formed of paper or other thin flexible material, and adapted to confine the coin so that a considerable portion is exposed to view, is illustrated herewith, and has been patented by Mr. George L. Castner, of Memphis, Tenn. The body of



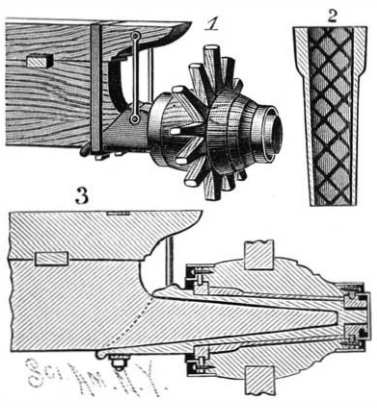
CASTNER'S COIN PACKAGE.

the holder proper is made by bending a strip in the form of a rectangle, a binding strip being pasted to the back of such holder, so that it is normally adapted to overlap the open ends, inclosing the coin when the ends are brought together on the top. The ends of the body strip may be enlarged on one side, as shown in the engraving. A package may be made on a similar principle to hold a number of packets, the package then having a broad backing piece, with narrow binding strips attached thereto, in such way as to facilitate tearing off a portion of the packet or holder containing one or more packets.

AN IMPROVED AXLE BEARING.

The illustration herewith shows an axle bearing for wagons which is designed to be simple and durable, and prevent any dust or grit from passing to the inside of the journal. This invention has been patented by F. Strauss, of La Crosse, Wis.

The axle carries on each end a tapering projection, square in cross section, as shown in Fig. 3, fitting into a correspondingly shaped aperture formed centrally in a skein fastened by a clip to the axle. On



STRAUSS' AXLE BEARING.

the skein is mounted the journal, having on its inside diagonal channels, as shown in Fig. 2, to distribute the oil or other lubricant. The inner end of the journal has the usual lugs driven into the hub of the wheel, and on the inner end of the skein is a shoulder, against which rests a collar, secured on the skein, and having on its rim an annular groove, into which loosely fits a rubber washer resting against the inner face of the hub, and connected thereto by screws. In front of the washer is a metallic cap protecting the rubber from wear. On the outer end of the skein is a threaded offset, on to which screws a nut abutting against the ends of the journal, there being an annular groove in the nut into which fits loosely a rubber washer, on which is a cap secured by screws. The edges of the inner and outer washer and their caps are covered by bands. This axle bearing is especially designed for hay and barrel wagons, being durable and convenient, and so constructed that the outer screw of the axle can be adjusted to the width and weight of the load.

AN ADJUSTABLE LEG FOR CHAIRS.

An adjustable leg which may be easily attached to or detached from chairs or other articles of furniture, to vary their height, and which is particularly applicable in accommodating a chair to the growth of a child, is illustrated herewith, and has been patented by Mr. Hasbrouck Alliger, of Rondout, N. Y. A wedge-shaped block is used, having teeth at its upper end to engage the under side of the chair seat, and on the outer side of the block are numbers representing inches and fractions thereof, the block also having a longitudinal slot. An auxiliary leg, slotted, is adapted for engagement with this block by a bolt passing through both slots, and having a washer and wing nut. A hook with threaded shank and wing nut is also passed through and held in engagement in the slots, the hook being adapted to engage a round of the chair when the auxiliary leg has been fixed at the desired length, and the upper toothed end of the wedge block is driven into the under side of the chair seat or frame. Fig. 3 shows a modified form of the device, in which the wedge block may be dispensed with, the auxiliary leg being made longer, and its lower end made up of a series of spheres, which may be cut off as desired to lower the chair.

AN IMPROVED FOLDING BATH TUB.

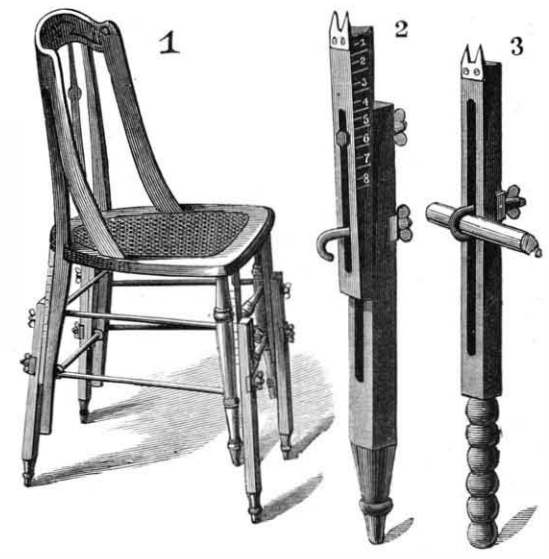
A bath tub which may be folded in small bulk when not in use, and for transportation or storage, is illustrated herewith, and has been patented by Mr. Ransom Sabin, of Shelby, Mich. Each of the sides has a pair of folding legs, the legs each being held in vertical position by a pivoted catch when the bath tub is set up for use. The ends are each composed of two parts, hinged together at their inner edges, and at their outer edges hinged to the sides, a bolt and socket being provided on each end to lock the end parts in open position. A flexible sheet of rubber cloth or other waterproof material is secured to the side and end pieces, such sheet being of sufficient dimensions to provide ample space for the purpose of a bath when the device is set up. Two straps are also employed, running under the flexible sheet, which may be used to hold the parts together in folded position, as shown in Fig. 1, or these straps may be used to divide up the area of the bath tub into compartments when its whole space is not required.

For further particulars relative to this invention address the inventor, or Mr. Erwin Stanhope, of Mears, Mich.

THE MUD LAFF.—(*Synanceia verrucosa, Cuv.*)

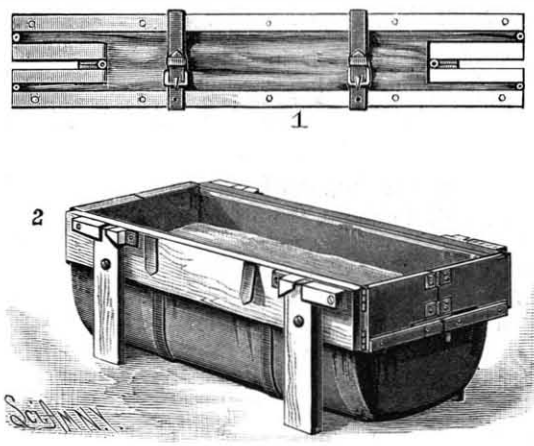
BY NICOLAS PIKE.

This curious fish, of such evil fame from its poisonous spines, is a native of the shallow waters within the reefs that nearly surround the island of Mauritius, in the Indian Ocean. This hideous and disgusting-looking fish averages from 16 to 18 inches in length. The spongy, wrinkled skin is blotched with gray, brown, and white on an olive ground, but is so generally covered with mud and weeds, it is only after a deal of trouble it can be cleaned. It seems to exude a glutinous matter, which, attracting anything that it comes in contact with, forms a thick coat over the whole body. The dorsal resembles an irregular row of tubercles, each with a spine, rather than a fin, and the wide, puffed-out pectorals give the appearance of a ruff round the neck when swimming. Being the color of the mud, it is difficult to distinguish at a short distance, and its small bright eyes near the top of the head enable it to lie in wait unseen by its victims. The brute flattens out the great pectorals, and squats in the mud, the head thrown back in the thick folds on the shoulder, and the great mouth wide open to catch any unwary fish that may pass that way. The prey is sucked in and swallowed, but it is a sorry day if human hand or foot touches it. I managed to escape them in my wanderings in search of marine curiosities by wearing very thick boots. I was anxious to experiment on the fish, and secured an expert old fisherman's services. The natives use the laff as food, and in spite of the dangerous wounds caused by the spines, those skilled in reef fishing actually catch the creature with the bare hand, and I never heard of an accident to them. When a laff is discovered, the wary fisherman, knowing it to be a sluggish fish, not likely to move quickly, creeps slowly up to it, and stooping down lowers his hand gently till it is below the level of the mouth, when with a sudden jerk he clutches it by the lower jaw, and draws it up, and it can plunge as it will, but cannot use the spines if held firmly.



ALLIGER'S ADJUSTABLE LEG FOR CHAIRS.

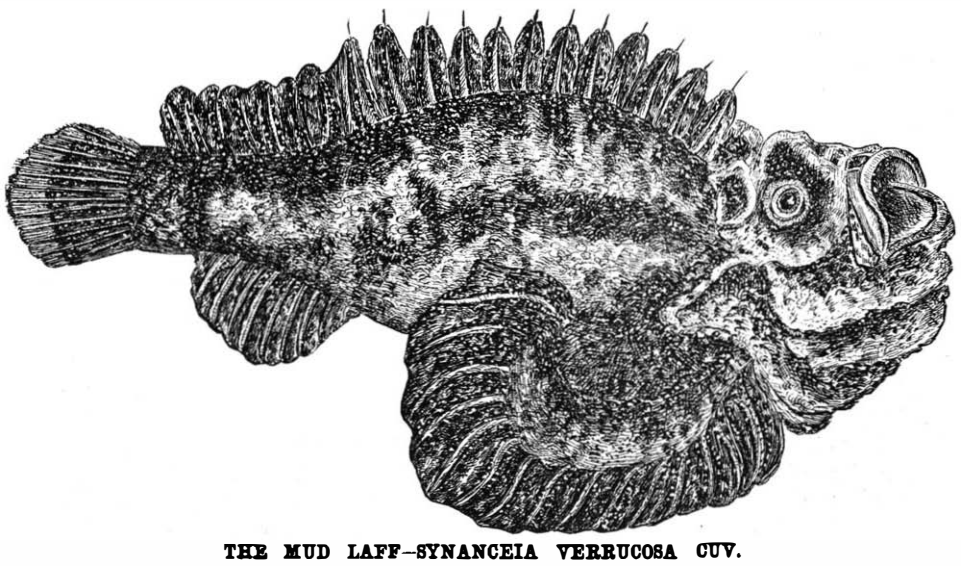
My man caught me several specimens. One we laid on a dish, and I tickled it under the pectorals, when the dorsal, which lies in a lumpy mass on the back when



SABIN'S FOLDING BATH TUB.

undisturbed, was quickly raised, the spines protruded, and when the fin was touched, the fish, with a spasmodic jerk, ejected a greenish, slimy substance from the hollow spines, and this I concluded was the poison injected into wounds, making them so difficult to cure. To prove the dangerous nature of the poison, I punctured the ball of the foot of a kitten with one of the front spines (said to be the worst), and it was immediately affected, and died in convulsions in an hour.

I saw one poor fellow who had trodden on a laff, and had wounded the ball of the great toe of the right foot. It was much swollen, and I opened the wound with a scalpel and applied a strong solution of ammonia to it. His comrades made a poultice of the leaves of a plant near by, and this gave him a little relief. I gave him a good glass of rum, for he nearly fainted from the agony, and his state of alarm lest lockjaw should ensue was



THE MUD LAFF—SYNANCEIA VERRUCOSA CUV.

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pitiful to see. He felt the effects of the wound for many months.

Several gentlemen interested in the subject met to witness the dissection of a laff, and their notes and my own were similar, so I give a *resume* of them.

The dorsal fin begins behind the nugue, and it is composed of a series of fleshy tubercles, twelve containing spines and eight rays embedded in the skin. The tubercles are bound together by a membrane full of numerous nervous cords. This membrane is endowed with great retractability, allowing all the spines to move at the same time. Each spine is covered by the skin as in a sort of scabbard, in which the spine disappears, and is only protruded when the fish is attacked. Each of the spines presents on both sides, for two-thirds of its length, a groove, fining off at the point. At the base of this groove, and in communication with it, is an ovoid vesicle or gland adhering to the spine and hidden by the skin. It contains a whitish liquid, which is the venom that renders the prick from a laff so formidable, and so fatal in certain cases.

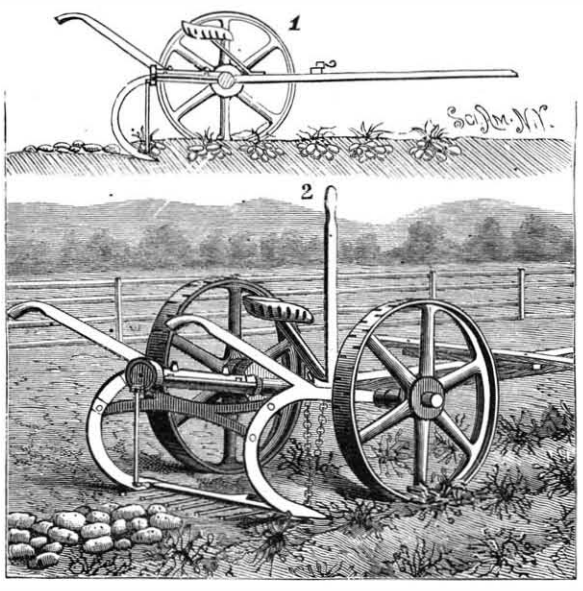
When a foot is inadvertently pressed against the body of the fish, it produces the erection of the spiny crest, enveloped in a skin rich in nervous threads, which are very extensible. The membraneous vesicle being compressed, the liquid it incloses flows along the grooves of the spines, spurts out, and penetrates rapidly and deeply into the wound. The venom of the laff, like that of the viper, has less effect when in fleshy parts covered with fatty tissue, where the venous system is little developed, than when it penetrates a vein. When a wound is at any extremity it becomes instantly painful, a circle of livid red surrounds it, with rapid swelling. Later an abscess forms, and when opened a fetid brown pus flows from it, at the same time pallor of the face, a feeling of stupor or weakness ensues, syncope, and often delirium and death.

The fishermen use the following remedy. They take a certain quantity of the leaves and stems of the *Microrhyncus sarmentosus* and mix in a handful of common salt. The whole is enveloped in a piece of banana leaf and covered with hot ashes till the leaves are reduced to a pulp. The wound is scarified, and the pulp used as a poultice, and changed every four hours. Some of the men have great faith in this remedy, but all dread the danger, as the cure, if effected, takes a long time, and the pain is terrible. I visited several of the hospitals in Mauritius, and saw some cases of laff wounds. One was especially terrible. The poor man had been out fishing on the reefs and, when quite a distance from the shore, had trodden on a laff. The puncture was on the sole of the foot. He was alone, and it was with the greatest difficulty he could drag himself to shore, the pain was so excruciating. When out of the water, he fell down, and it was some time before he was discovered. By this time the leg and foot had swelled tremendously, and he had to be carried to the hospital. In a few days the wound sloughed, leaving a large hole. It was over two months before he could use his foot, but he remained a cripple for over a year, and he could never be induced to go on the reefs again.

A singular fact attending wounds by the laff spine is that, no matter how long a time may have elapsed since the cure, at the same period of the year pains in the wounded parts occur, as they often do after snake bites.

AN IMPROVED POTATO DIGGER.

A simple form of potato digger, adapted for attachment to and use with a mowing machine when the sickle has been taken off, is illustrated herewith, and

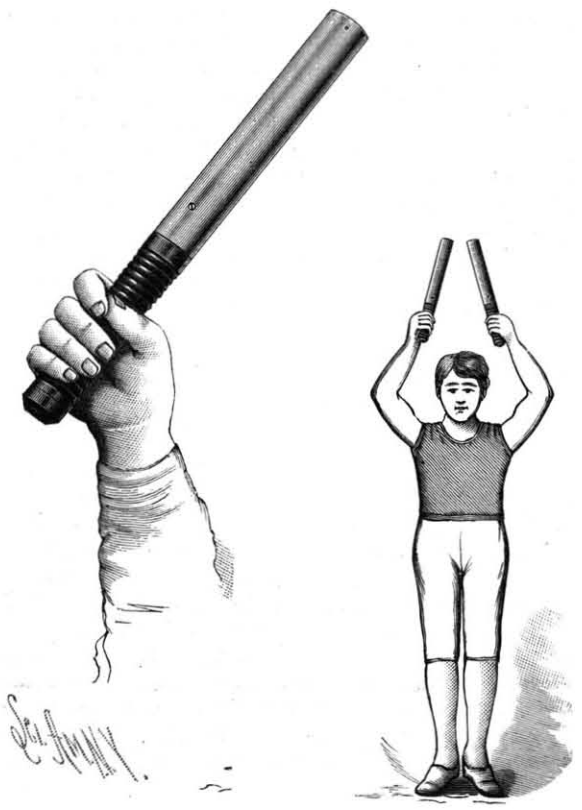


SHAW'S POTATO DIGGER.

has been patented by Dr. Hiram M. Shaw, of Genoa, N. Y. The frame of the potato-digging mechanism consists of two beams or bars held by pivotal connections to opposite ends of the axle, to be raised and lowered by handles to be grasped by the operator walking behind the machine. The digging blade or hoe, extending across at the rear, is fixed at its ends to the lower forwardly curved ends of the beams, the blade lying nearly flat, and having a central projecting point which cuts into the hills of potatoes as the machine moves forward. The potatoes and dislodged earth pass backward over the blade on to an agitator, which separates the earth from the potatoes, so that the latter may be conveniently gathered. This agitator consists of a bar pivoted at opposite ends in the beams, and ranging immediately behind the hoe blade, the bar having backwardly extending fingers or tines. Near one end of this agitator bar is a pin or arm, to which is attached the lower end of a pitman, the upper end of which connects with a wrist pin set eccentrically in a disk wheel on a shaft journaled in a laterally bent portion of one of the hoe beams and an arm connected thereto, in such way that the fork or agitator will be oscillated vertically as the machine moves forward. The machine is not liable to get out of order, and may be successfully worked by any farm hand.

THE JESSUP EXERCISING CLUB.

Mr. Benjamin A. Jessup, an amateur athlete of this city (225 Pearl Street), has designed a new exercising



THE JESSUP EXERCISING CLUB.

club, of which we herewith give an illustration. It possesses several very desirable features. It takes the place of and combines the advantages of dumb-bells and Indian clubs—articles which are more or less bulky and clumsy. The new club is 20 inches long, 1 5-16 inches diameter, and weighs 1 pound 12 ounces. It consists of a bar of hickory, 14½ inches long, of which the handle is 6¼ inches long, turned as shown. Upon the front end of the handle is secured by a screw a plain brass tube, ⅛ of an inch thick and 7½ inches long. Within the extremity of the tube is secured, by screws passing through the tube, a plug of lead weighing 12 ounces. With these particulars any one may make the articles, and a little faithful exercise with them daily will in a few weeks greatly tone up and strengthen the system of the user, whether man or woman. The author, Mr. Jessup, attributes his excellent health and almost perfectly proportioned bodily development to an extended use of these clubs. Our own experience with them, although short, is very satisfactory. All the various exercises of clubs and dumb-bells may be done with them. The loaded ends enable the user to increase or diminish at will the leverage and weight brought upon the muscles of the arms, wrists, and other parts.

The rowing motion for oars may easily be produced. Among other advantages not least is that these exercising devices may be easily transported in bag or trunk, and form, in themselves, an effective gymnasium.

The New Torpedo Boat, and Practice with High Explosives.

The new torpedo boat for the United States navy is rapidly approaching completion in the yard of the Herreshoff Co., at Bristol, R. I. With a length of 137 feet and width of 14 feet 6 inches, the new boat is to draw but 3 feet 7 inches. She will possess many of the Herreshoff peculiarities—a rudder under her hull instead of astern, a set of their twin five-cylinder compound engines, etc. She is to carry two torpedo tubes, as well as two 6-pounder machine guns. The highest anticipations of her speed are indulged in, very naturally, when the immense horse power of her engines is considered. These are calculated to develop 1,500 horse power. The boat is to have only 99 tons displacement. When completed, the hull will be nearly filled with boilers, magazines, and machinery for propulsion of the vessel and for ejection of torpedoes, leaving little room for accommodation of officers and crew.

Some interesting experiments have recently been conducted in England which gave a practical demonstration of the possibilities of modern ordnance and high explosives in artillery practice. An old ironclad, the Resistance, was heavily plated and fitted with protective coal bunkers and casemates. Wooden dummies were placed in the latter to represent men. Thus equipped the ship was made a target for practice with gunpowder and high explosive (lyddite) shells. Eight 6 inch shells annihilated the upper works of the vessel. The powder shells did most execution, as they penetrated further before explosion and did more general, because less localized, damage.

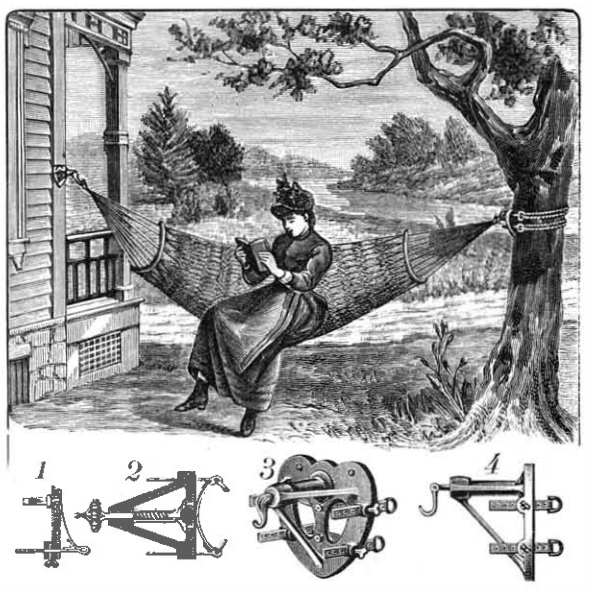
These tests are of interest in connection with aerial torpedoes, as they indicate the kind of trial so much desired. The destruction of the Silliman showed their power against the hull under water; their power against plated sides and protected work above water remains to be seen. It is to be hoped that our government will follow the example and give the torpedo boats an armored vessel to test their destructive powers.

A New Alloy.

This alloy is intended to be used in the place of steel in the manufacture of various parts of watches, such as the balance wheel and hair spring, so as to obviate the disadvantages which follow on their magnetization or oxidation. The composition of the alloy is as follows: Gold 30 to 40 parts, palladium 30 to 40 parts, rhodium $\frac{1}{10}$ to 5 parts, copper 10 to 20 parts, manganese $\frac{1}{10}$ to 5 parts, silver $\frac{1}{10}$ to 5 parts, and platinum $\frac{1}{10}$ to 5 parts. The copper and manganese are first of all to be melted, and the other metals afterward added, or the whole of the constituents may be placed in the crucible at once, with the manganese at the bottom.—*By H. Ostermann and C. Lacroix, Geneva.*

AN IMPROVED DEVICE FOR SUSPENDING HAMMOCKS.

A readily adjustable device for suspending hammocks in various situations, by which also the hammock will be to some extent automatically swung, while a limited endwise motion is allowed, is shown in the accompanying illustration. The invention has been patented by Mr. John D. Pritchard, of Topeka, Kansas. The device consists mainly of a bracket to which is hung a spring-actuated hook, while pairs of metal plates, with suitable cords or straps, constitute a clamp to hold one or both bracket-supported hooks to a tree, the bracket itself being primarily adapted for attachment to any flat surface. Figs. 3 and 4 represent the hammock hook and its supporting bracket, while Fig. 2 is a plan view. The hammock, at its upper portion, is branched to form three separate arms, which receive between them two arms of the forked end of the hook shaft, these arms being pivoted or hung together by a pin to allow free swing of the hook toward and from the bracket plate. The hook shaft at its inner end has a half-ball head fitting loosely within a cupped bearing, and to the shaft is fixed one end of a coiled spring, inclosed by a sleeve, the other end of the sleeve being fixed to a lug on the cupped bearing, these springs being adapted to assist in carrying the hammock back and forth with an easy motion, after it has been swung to either side by the person occupying it. To attach the bracket to a tree or post, clamping plates are provided, of a form to be securely held to the bracket by thumb screws, these plates having eyes in which are placed metal loops to which straps or ropes are connected, to bind the plates, and consequently the bracket, to a round tree or post. The clamp plates are removed from the bracket when the latter is to be secured to a flat surface, while they are flexible, and so adjustable forward or backward in the main bracket plate as to allow of their ready attachment to trees or posts of any diameter.



PRITCHARD'S HAMMOCK SUSPENSION DEVICE.

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VIEWS IN ALASKA.

During the past four summers expeditions have been sent to Alaska, under the auspices of the United States Coast and Geodetic Survey, to survey and map out with greater accuracy the waters of this little visited coast. Upon the completion of the Northern Pacific and Canadian Pacific railroads, this remote territory, which had been previously known to us only through the atlas, became suddenly more accessible and an object of interest to others besides the United States government. The voyage from Washington Territory is not a long one, and the trip has become popular, owing to the fact that the voyage may be confined almost entirely to the sounds and inland seas which border the northwestern portion of the Pacific coast. The character of the country is very different from that of our Western States, and presents a very different civilization, if civilization it may be called. There is a peculiar flavoring and intermixture of the Russian and Indian which gives a foreign interest to the American visitor or tourist.

There is a very natural misconception in regard to the climate of Alaska. Owing to its high latitude, one would expect to find an Arctic climate, but on the coast this is not altogether the case. The high range of mountains which extend along the southwestern coast shut off the cold northern and northeastern winds from the ice fields of the interior, while the warm equatorial currents of the Pacific, which correspond with the Gulf Stream on the eastern coast of the continent, pass close to the shore and temper the climate.

It must not be supposed that the climate is what we consider temperate here, as the latitude is too high and there are too many glaciers and icebergs in immediate proximity to render this possible; but the winters are mild as compared with the cold in the interior, and the changes of temperature between the summer and winter are not great.

As will be remembered, Alaska was purchased from the Russian government in 1867 for $7,200,000. From north to south the extreme distance is about 1,100 miles, while the greatest breadth, not including the Archipelago, is about 800 miles. It comprises an area of about 514,700 square miles. Alaska can boast of having one of the largest rivers of this continent, the Yukon, which rises in British America and flows into the Pacific south of Norton Sound. It has a width of a mile at a distance of 600 miles from the sea, and its delivery of water is so great that it loses its saltness ten miles from its mouth. Many of the mountains along the coast are volcanic, while Mt. St. Elias, with an altitude of some 17,000 feet, is higher than any mountain in Europe.

The scenery along the coast which has been visited by the government expeditions is very grand and beautiful, and the engravings, which we have prepared from photographs taken on the last expedition by Commander Thomas, do not do justice to its beauties, and are of interest only when studied and when the gigantic proportions of some of the features of the country are appreciated, by comparing the icebergs, the glaciers, and the waterfalls with objects with which we are familiar. The steamer used on these expeditions was constructed especially for use on these surveys, and a good idea of the steamer Patterson may be had from Fig. 5.

Fig. 1 represents Le Conte Glacier, which extends into Le Conte Bay, which is virtually inaccessible for vessels, owing to the immense amount of floating ice that is always to be found in the bay. Some idea of the danger may be inferred from Fig. 7, which shows the large iceberg at the mouth of the bay, towering hundreds or thousands of feet above the government vessel, which has ventured to run in among these floating islands. The glacier extends to the water's edge, and with the rise of the tide enormous blocks of ice are broken off and fall into the water with a thundering report that may be heard for miles. Another view of the glacier is seen in Fig. 11. The scenery shown in Fig. 2 is said to be as beautiful as any in Alaska, and the bluffs, beside which the steamer Patterson appears like a speck, rise to a height of some 2,000 or 3,000 feet, and are covered with green vegetation, while the ravine between the two mountains boasts of the most beautiful waterfalls and the wildest torrents, in the quieter pools of which trout and salmon are found. This is near the Baird Glacier. Fig. 3 is a view in the so-called Portland Canal. The Patterson is seen passing icebergs before entering Wrangel Narrows in Fig. 4, and in Fig. 5 she has passed the narrows and is lying at anchor with the Vixen alongside, while the Devil's Thumb may be seen in the distance. A wind-swept point on Thomas Bay is shown in Fig. 6, in which it is observed that the trees are developed only on one side, owing to the prevalence of the wind from one quarter of the compass. One of the most beautiful waterfalls in Alaska is that of Horn Cliff (see Fig. 8). The torrent seems to spring from the top of the cliff, and falls in a broken course to the waters of Frederick Sound below.

The astronomical station on the moraine of Baird Glacier is shown in Fig. 9. Fig. 10 gives a view of the settlement of Fort Wrangel, which boasts of a missionary establishment and a school for young Indians. It is, or will be, a rather important center, and in the last picture on the page will be seen the steamer Alaskan, which plies between Fort Wrangel and the gold region up the Stikine River. Fig. 12 is the Patterson Glacier, which has its source near the Devil's Thumb, 20 miles from its foot.

Alaska is not, and never can be, an agricultural country. It has very little arable land, and the warm seasons are so short that crops have not sufficient time to mature. There is a farm near Fort Wrangel, which is worked by the young Indians of the school in connection with the mission, but this is the only tract in the Territory that could bear the title "farm." The wealth of the country consists in the game and fish, which is very abundant, and in the rich forests, which seem almost inexhaustible. The prevailing forest tree is the spruce, which grows to great size, and is found 2,000 and 2,500 feet above the sea. They grow often to a height of 200 to 250 feet, with a diameter of from 4 to 6 feet. Hemlock, alders, and willows also abound, but the most valuable tree, perhaps, is the yellow cedar, which is found in considerable abundance, and which grows to a large size. It is valuable for cabinet wood and for use in ship building. When the wood in the Pacific States becomes less abundant than it is at present, Alaska will be resorted to, and its enormous supply will be found of inestimable value. We propose supplementing this article with another descriptive of the life and character of the inhabitants of Alaska. So little has been written and is known of Alaska, that the researches of the government in that field become of interest and importance, and all credit for the work already achieved in due to the commanders of the various expeditions, Lieut.-Com. Henry F. Nichols, Lieut.-Com. Richardson Clover, Lieut.-Com. Albert S. Snow, and Lieut.-Com. Charles H. Thomas.

Artificial Sugar, Coffee, and Cocaine.

The problem of producing cane sugar synthetically, though still far removed from the point when it can be used practically, has been brought another step nearer solution by the continued researches of Emil Fischer, in conjunction with Julius Tafel. In a recent paper, published in the *Berichte* (1889, 97), they give the results of their researches, the most remarkable of which is that they have succeeded, for the first time, in producing a sugar which can be fermented by yeast, like the natural sugars. The only difference from the latter is this, that the artificial sugar is optically inactive, but the discoverers hope to obtain optically active sugars by means of fermentation. The new sugar has, provisionally, been called *acrose*. The starting point is glycerin, from which, by way of its decomposition product, *acrolein*, two new kinds of sugar: $C_6H_{12}O_6$ had already some time ago been prepared by the authors, by means of treatment with baryta or alkalies. One of these sugars had been designated *alpha-acrosazon*. It has now been found that this latter may be partly converted, by means of hydrochloric acid, into a new substance, resembling glucoson, which the authors term *alpha-acroson*. When this is treated in a dilute aqueous solution, with zinc dust and acetic acid, it is completely reduced inside of one hour. The mixture is then treated with hydrosulphuric acid, the precipitate filtered off, and the filtrate evaporated in a vacuum. The residue is dissolved in absolute alcohol, the solution filtered, and the filtrate, after being highly concentrated, mixed with much ether. This precipitates the new sugar, *acrose*, in colorless flakes, which soon change to a sirup, and has the greatest resemblance to natural sugars, having a sweet taste, reducing Fehling's solution, and responding to other tests characteristic of sugars.

Merck some time ago announced that he had succeeded in producing true salts of caffeine with citric, cinnamic, and hydriodic acids, which did not decompose or split up when coming in contact with water. It will be remembered that Prof. J. U. Lloyd (see *New Rem.*, 1881, 38) succeeded in preparing crystallized caffeine citrate, but this salt did not bear solution in water without decomposition. In what manner Merck succeeded in producing a permanent salt is not stated. But the citrate, as now available, is stated to be soluble in 30 parts of water at 42° C.

Alfred Einhorn has succeeded not only in making cocaine, the alkaloid of coca leaves, artificially from benzoyl-ecgonine, by introducing into it the methyl group, but he has also found that a whole series of other "cocaines" may be obtained by causing other groups to enter instead of the methyl group. In a recent paper (*Ber. d. deutsch. chem. Ges.*), he announces and describes three such compounds, one of which is the lower homologue of true cocaine, while the others are metameric or higher homologues. Two of these could not be obtained in a crystalline form, but only in form of oil. The third, however, as well as the salts of all three, are crystallizable. Whether any of these new "cocaines" possess special therapeutic properties has not yet been ascertained, or at least not been announced. It is not improbable that some of them will be found serviceable.—*Amer. Druggist.*

Correspondence.

Gas in Heating Pipes.

To the Editor of the Scientific American:

I have noticed, with much interest, the article in your journal of March 30 in regard to the question of gas from steam and hot water heating boilers. I have erected several steam and hot water plants, but have never noticed the occurrence spoken of; however, if such is the fact, I think the gas is hydrogen, formed by the decomposition of water in contact with the iron of the pipes and boiler; this would occur with either hot water or steam.

I think this would make an interesting question for your readers to discuss. W. H. SHAY.

Fishkill Landing, N. Y., March 30, 1889.

Gas Generated in Heating Pipes.

To the Editor of the Scientific American:

In your issue of March 30, I notice a letter from John P. Nessle, Newark, N. J., on the generation of gas in steam and hot water radiators. Last fall I had a *hot water* apparatus put into my dwelling house, with nine radiators. All those on the ground and first floors worked well, but on the second floor I had one radiator put up in the hall to heat rooms in Mansard story. Above this last was placed the usual expansion tank, with pipe to roof. Water is supplied to the boiler in basement from city water works, and a glass water gauge on the expansion tank shows how much water is in it at a glance.

Now, this radiator in the Mansard story hall does not work well, and got gradually colder and colder from the top downward, no matter how hot a fire. On opening the air cock in the radiator, what I supposed was air always rushed out with a hissing noise every time.

One day, during my absence from home for two weeks, my wife went up to this radiator with a small lamp in her hand to open the air cock. Immediately after opening the cock, what proved to be gas of some kind exploded on contact with the lamp flame, and continued burning at the air cock until water began to run from it.

The steam fitter who put up the apparatus could throw no light on the subject, and never before or since has had any similar case occur with any hot water apparatus put up by him. I should be glad to know what kind of gas is generated, the reason of its being generated, and how it may be prevented.

A. K. ROSS.

40 Cecil Street, Toronto, March 29, 1889.

[This is an interesting case. Perhaps some of our readers can throw light on the subject. If the gas should again show itself, we hope our correspondent will collect a specimen and have it examined by one of the college chemists.]

Gas from Steam Boilers.

To the Editor of the Scientific American:

I wish to add my testimony to that of Mr. Nessle and others with reference to the occasional presence of gas in steam boilers. Though the discovery may not be new to scientific men, I will venture to say that little is known about it generally by those who use steam, and some ventilation of the subject may not be devoid of practical value.

The building of which I have charge is heated by steam taken from a boiler which is used exclusively for that purpose, the steam being allowed to go down at night. Some time ago a strong odor of coal gas was noticed by myself and others, coming from the air cock in a large radiator up stairs. I did not try it with a match as your other correspondents did, but the smell was unmistakable. This continued for several days, when I thought it advisable to blow out the boiler, as the water was becoming dirty. On applying the wrench to the stop cock in the blow-out pipe, the latter parted at a joint inside of the brickwork of the furnace, and the boiler was blown out in a very summary manner. After the pipe was repaired and the boiler resumed work, no more odor of gas was found.

From these data the theory at once suggested itself that the weak point in the pipe had been leaking, and that the gas, which was sucked in from the coal fire by the vacuum in the boiler when the steam went down, was given off again at the air cock when the pressure was put on in the morning.

This theory, however, while it seems satisfactory enough in the case I have mentioned, would, perhaps, not apply to the hot water apparatus.

W. F. VROOM.

St. Stephen, N. B., April 1, 1889.

The Eiffel Tower.

The Eiffel Tower reached its full height, 1,178 feet, March 31. A newspaper correspondent who went to the top says that the ascent by the staircase took forty minutes, and by elevators it is to be made in five minutes. It is expected that the electric light on its top will enable one to read a newspaper at a distance of seven miles.

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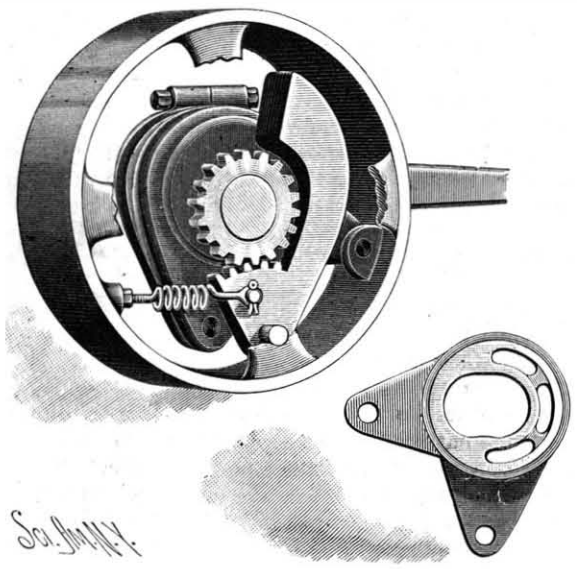
AN IMPROVED CENTRIFUGAL GOVERNOR.

A governor designed to act with great accuracy in cutting off the supply of steam to the cylinder, so made as to lock in every position, and of sufficient strength to work an unbalanced valve, is illustrated herewith, and has been patented by Messrs. Henry L. Berger and Edward Noel, of Youngsville, Lafayette County, La. It is a centrifugal governor, having two eccentrics pivotally connected with each other, and controlled by a weighted arm, the small figure showing a face view of the valve eccentric. A pulley is secured to the main driving shaft, the pulley having on the inside of its rim a lug, on which is pivoted the arm of an



BERGER & NOEL'S CENTRIFUGAL GOVERNOR.

eccentric, having an elongated central aperture, through which passes the main driving shaft, there being fitted on this eccentric the eccentric strap, connected in the usual manner by the eccentric rod with the slide valve in the steam chest. On the eccentric is also secured an arm, which extends nearly at right angles to the other arm, and is pivotally connected by a pin with the arm of an eccentric strap, mounted on an eccentric, which is held to rotate loosely on the main driving shaft, the latter eccentric having its center inside of the periphery of the shaft. On one face, also, of this eccentric is a gear wheel, the center of which is in the main driving shaft, and the gear meshing into a segmental gear wheel, pivotally connected to one of the spokes of the pulley. A spring is connected by one end to the segmental gear wheel, its other end being fastened to the rim of the pulley, and held in place by a jambnut, by adjusting which the tension of the spring may be increased or diminished to hold the weight and the segmental gear wheel in proper position. The arrangement is such that the valve eccentric is controlled by the action of the weighted arm, and is locked in place by the second eccentric, actuated by this arm, whereby the admission of steam into the cylinder is regulated according to the desired normal speed of the engine.

A New Gunpowder.

A new gunpowder, the invention of Mr. Hengst, has recently been tested, and the results point to it as a promising substitute for black powder for military and sporting purposes. The new powder is prepared from straw, which is pulverized, chemically treated, and finished in granular form for use. It is claimed for this powder that it is smokeless, flameless, practically non-fouling and non-heating, and that both the recoil and the report are less than those of black powder, with superior penetrative power. From the powerful character of this explosive, which, weight for weight, is 150 per cent stronger than gunpowder, and is not explodable by concussion, it is probable that in a compressed form it will be found to be applicable to blasting purposes. In every respect it appears to be a powder of great promise.

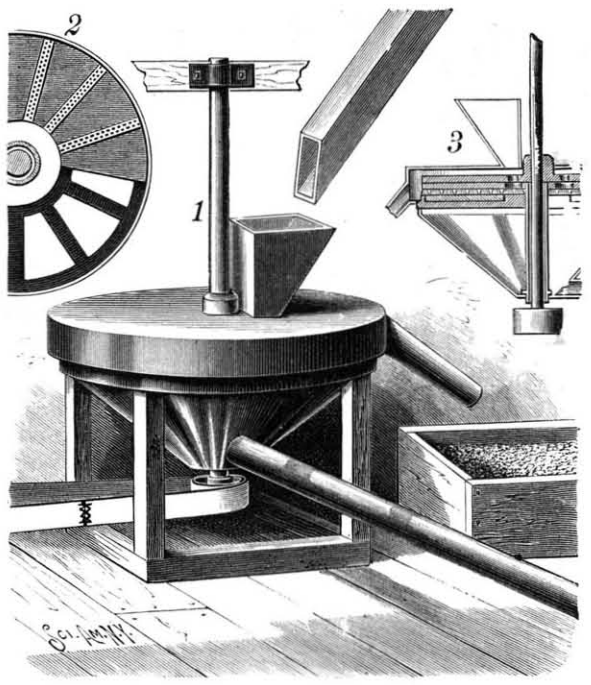
LARGE TWIN GAS ENGINE.

The large twin gas engine which we illustrate has a nominal collective power of thirty-two horses, and comprises two of Messrs. Crossley Brothers' ordinary sixteen horse power engines combined. Each cylinder has a diameter of 13 in. by 21 in. stroke, and the two collectively will indicate about seventy horse power with Dowson gas, or between eighty and ninety with coal gas. The engine is fitted with the makers' newly patented igniting arrangements, whereby all slides are dispensed with. It is started by a small separate starting engine, not shown on the engraving, so as to be under control of one attendant. It forms a very handsome and reliable job, and is probably no more liable to accident or stoppage than any high-class steam engine.

When using Dowson gas, this engine will run for about 1¼ lb. of anthracite coal per indicated horse power per hour. The makers affirm that the governing arrangements are more perfect than in any steam engine as regards reduction of fuel consumption with corresponding reduction of power. The friction of this particular engine has not been accurately measured, but is probably no more than one-sixth of the indicated horse power, if so much, and it is expected it will be capable of giving close on sixty brake horse power with Dowson gas. The cranks are placed opposite each other, thus balancing satisfactorily, the crankshaft and many of the working parts being, of course, made of steel.—*Engineering.*

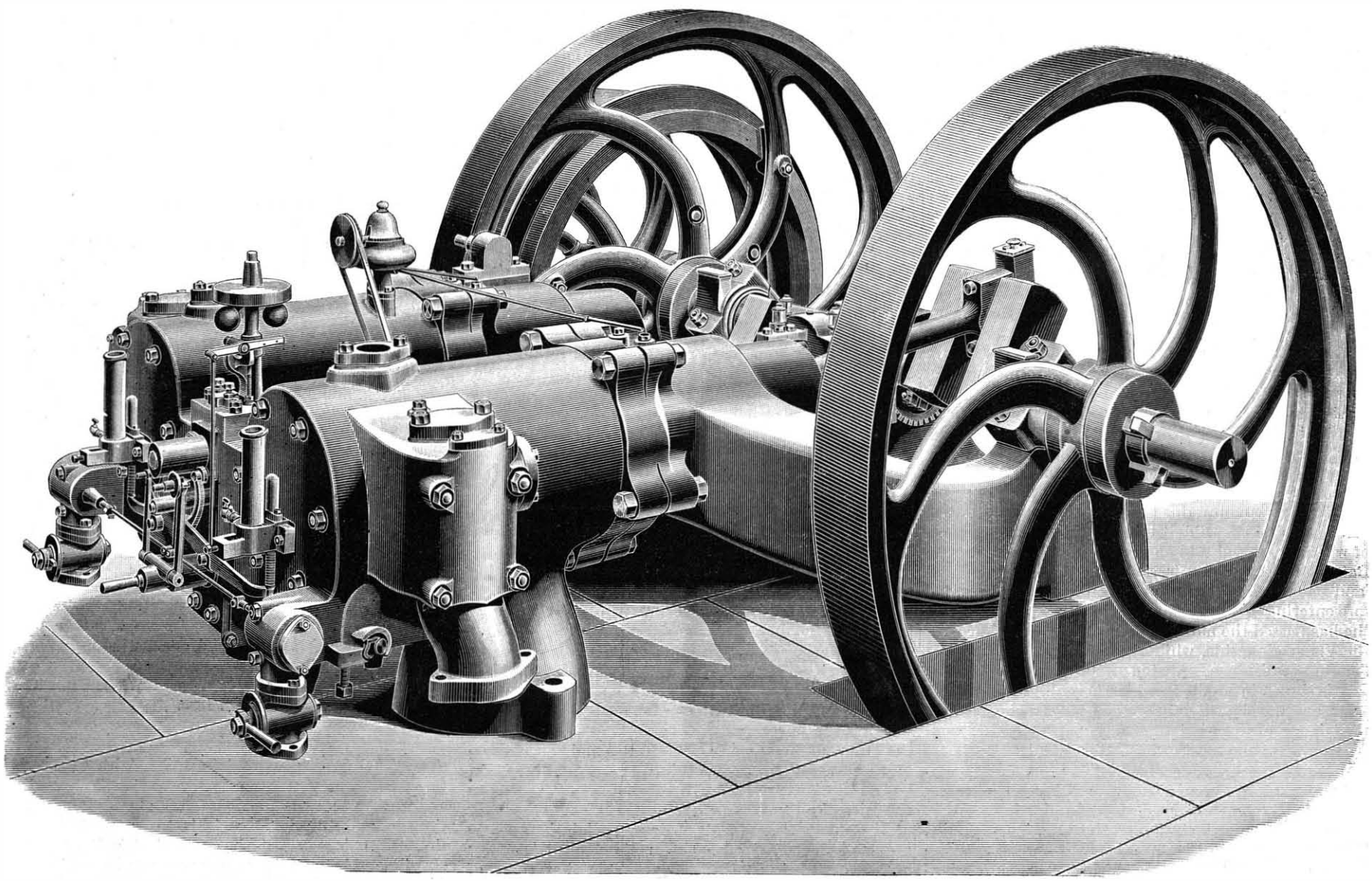
AN IMPROVED COTTON SEED CLEANER.

A cleaner designed to rapidly remove and separate all impurities from cotton seed is illustrated herewith, and has been patented by Mr. Christian Baumgarten, of Schulenburg, Texas. Within an outer casing is secured a fixed table, consisting of an open wheel supporting on top emery slabs or plates and metallic perforated plates placed alternately with the emery slabs, as shown in Fig. 2, with parts removed. The upper



BAUMGARTEN'S COTTON SEED CLEANER.

surface of the table is in contact with the ends of the bristles of a brush, formed in disk shape and secured to a vertical shaft inclosed in a jacket passing centrally through the casing, as shown in Figs. 1 and 3. The brush has openings near its hub registering with the lower end of a hopper held on top of the casing, while from one side of the casing, near the top, leads an outlet pipe for the cleaned cotton seed. To the bottom of the casing is secured a cone-shaped receptacle, with which the openings in the metallic perforated plates of the table communicate. A pipe leads from the lower end of this receptacle and is connected with an exhaust fan, which assists in drawing the impurities cleaned from the seed through the perforations in the plates, and discharging them where desired. The seed, fed through the hopper on to the table, and cleaned by being whirled around between the brush and the table, finally passes through the upper outlet pipe to a suitable receptacle or bag.



LARGE TWIN GAS ENGINE.

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THE PARIS EXHIBITION.

[FROM SPECIAL CORRESPONDENT OF THE SCIENTIFIC AMERICAN.]

The International Exhibition now begins to assume a more definite character, and the easy manner in which operations within it are being carried on indicates that the authorities are of opinion that all will be ready for the opening day—a consummation most devoutly to be wished, but rarely accomplished in the case of exhibitions, and especially those containing machinery.

The only part in which any pressing activity is apparent is in the grounds. The old soil (which looks as if much of it had at some time or other been paved with cement) is being carted away and replaced by a very rich mixture of peaty loam for the gardens. Among the trees and bushes that have been planted are some good samples of magnolias, but it is doubtful they will bloom this year, on account of having been so recently planted; nor do I think that the gardens will show to any very great advantage, except in so far as the flower beds are concerned, and one rockery that is already finished.

The utmost activity is being shown in grounds round about the Eiffel Tower, where the ground is deep in mire through the wet weather and the cartage of soil, which is being done in the usual one-horse cart that tilts to dump, nobody here seeming to have any idea of the American four-wheel cart with movable bars at the bottom, which is so much more handy. With the two-wheel cart and the horses tandem, the shaft horse does nearly all the work, and the two horses rarely start to pull together. There is so little moving of earth in London (whether because of its flatness or that there is less improvement, it is hard to say) that there is some excuse for using the old tilting cart; but one sees a great deal of this class of work in Paris (or, at least, such has been the case for the past few months), and American carts with movable bar bottoms would find plenty of use.

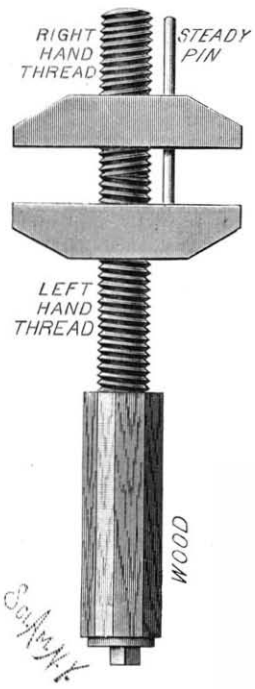
I mentioned in my last letter that the hoisting engines on the Eiffel Tower had Porter governors on them, but I omitted an item that I now supply, to wit, a piece of what I certainly consider, to say the least, unnecessarily expensive construction on at least one of the engines, and a sketch of which is given herewith, being the crank pin end of a connecting rod in which the key is secured by a small bolt and nut, the bolt passing through a slot provided in the key and through a projection on the head of the gib. This is a very expensive method of holding a key, and no better than a set screw.

First impressions are often modified by experience, and are hazardous to put in black and white; but, nevertheless, I venture to say that my first impressions of French engineering are that it is in a transitory condition, and that while I find much that is old and discarded in the United States and in England, nevertheless I find much that is new and evidencing a desire to adopt the most advanced methods.

In a former letter I called attention to the copying of American machines in England, and I see that since then one of the sufferers named by me (the Brown & Sharpe Manufacturing Company, of Providence) have publicly protested against this copying.

Now, I do not desire to enter into the moral ethics of copying, or the circumstances under which it is justifiable or otherwise; but I do wish to point out that, looking at the matter from a purely mechanical standpoint, I would sooner see a copy of a first class machine than a poor attempt to accomplish the same end by a roundabout method in order to avoid the stigma of copying. For instance, I saw in a large woodworking shop in London some emery wheel machines for saw sharpening, and they were a skeleton framework of wings and arms that one almost expected to see crawl around like a spider. To my mind, the designer had far better have copied some American machine right out, and the only consolation one had in looking at the machine was that the designer had at least had sense enough to know the value of emery wheels for sharpening purposes, and that is more than a good many, both in France and England, can say.

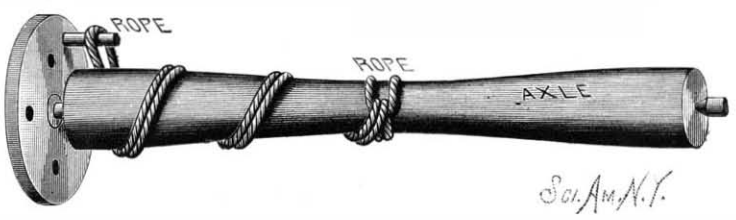
I have seen in France some very ingenious machines that I consider a decided advance upon anything I know of in the same line, but I have also seen some that, while good enough, for a beginning, are not equal to American machines designed for the same purpose; but whether this arises from a dislike to copying or ignorance of the existence of the American machines, it is hard to say. In either event, however, it gives evidence that there is a market here for American machines as well as small tools.



A FRENCH MONKEY WRENCH.

Speaking of small tools reminds me to give you a sketch of a French monkey wrench I saw the other day, the stem being threaded through both jaws, and a steady pin preventing them from turning with the screw. Now, putting aside the awkwardness of having the upper end of the screw stick out so that the wrench cannot be used in any other but the most open of situations, and the general heaviness and clumsiness as well as the uselessness of a double set of jaws, let us consider the cost of making such a tool as this as compared to that of making one of Coe's or any other first class American monkey wrench, and we shall see that there is more work in the right and left hand screw and the steady pin than there is in the whole American wrench.

But, before going any further, let me say that, while I propose to use an unsparing hand in criticising the machines and tools I find here, whether of French, English, or American origin, I shall nevertheless give a full measure of credit where it appears due, my object being to give a full account of all I see that is of interest to the mechanical world, and not to pick out either the good or the bad. This programme, however, naturally operates somewhat to the disadvantage of the French, since it is not the worst of English or of American tools or productions that are brought into France, the worst being left at home and not usually put forward by the home journals. As an illustration, take the case of the monkey wrench, which is by no means a fair representation of that class of tools as generally found in France. Nevertheless, I found it here, and do not remember ever having seen a worse one, although I have seen some pretty bad ones in England.



A FRENCH METHOD OF DRIVING AXLES IN THE LATHE.

A very neat and interesting wrinkle that I found in a French shop is that of driving an axle by a rope, as shown in the sketch. I never saw anything like it before, and am particularly pleased with it. There is no loose dog or clamp to slip about on the axle while it is being put in the lathe or to fall off the live center if it is hung there; there is no monkey wrench to pick up or look for to fasten the set screw of the dog or clamp; and, furthermore, the same sling will do for lifting the axle by the crane (if the lathe has one), and, finally, there is no slipping of the dog. A cut half an inch deep was being taken off the axle I saw this device on.

There is not much progress to report in the machinery department, but there are a great many foundations for engines and machines finished, with the bolts all in; and very solid they look, which is a source of comfort, as the giving way of foundations is not an uncommon occurrence at exhibitions, or, at least, this is sometimes put forward as the reason why a pound or a knock is heard when it should not be.

The girders for carrying the line shafting are all up, and I send you a sketch representing its construction. It is a built-up affair, composed of angle iron and plate, with braces. The shafting hangers are V-shaped, and are riveted to the plate, as shown in the sketch.

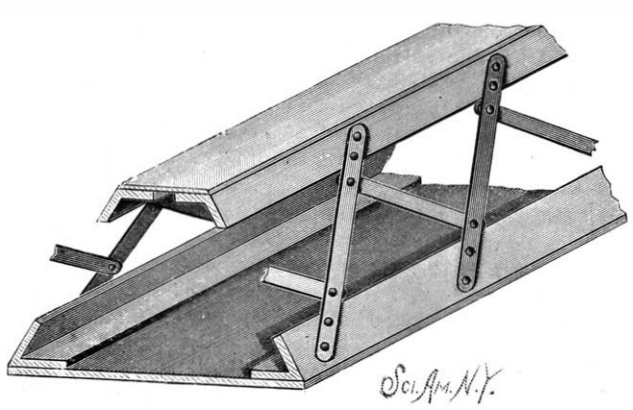
The window which occupies a great part (all the upper part) of the end of the machinery department is painted a pale yellow, with pale green and blue ornamentation, the latter also including some small crimson stars.

A good part of the ornamentation of the buildings is being made of sheet zinc, and I saw some (for the exterior of one of the domes) whose extreme dimensions were say six by seven feet. Finer examples of work in zinc I never saw or expect to see, the soldered seams being as clean and smooth as could be, notwithstanding their running around mouldings, beadings, etc. Indeed, there was not a sign of a crinkle or warp anywhere.

There are a great many cornucopiæ among the ornamentation (over 100 in the machinery department alone), filled with fruit, flowers, etc., and all these are worked up in zinc.

In some of the departments the cases are all ready for the exhibits, while in some instances these cases are being ornamented with plaster or stucco figures in a most effective manner, as the buildings are but temporary. These stucco figures serve very well and are light, being built up on a light wooden framework. A great deal of ornamental tile work is being used in the decorations, among which I noticed some tile casings for round columns, the sections being about two feet long, and in width embracing about a third of the circumference of the column. The surface had raised vines, leaves, flowers, etc., upon it, the whole giving a very pleasing effect.

J. R.



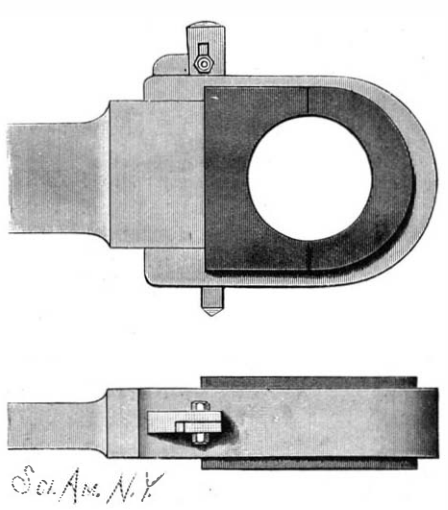
THE GIRDER FOR THE LINE SHAFTING AT THE PARIS EXHIBITION.

A Drop from the Clouds at Bombay.

The first descent from a balloon in India after the manner of Professor Baldwin took place at Bombay on January 27. The aeronaut was a young Englishman, Mr. Percival Spencer, who had created much excitement among the natives by the announcement that he would make an ascent in his balloon, the "Empress of India," and when attaining an altitude of 2,000 feet would leap into space and return to Mother Earth by means of a parachute. Accordingly an enormous crowd of some 190,000 persons assembled to witness the feat, and the aspect of the motley throng is stated to have been marvelously quaint and picturesque, the gayly decked Orientals in all colors of the rainbow, and in a great many which the rainbow knows nothing about, walking, driving, riding, crowding, along the dusty thoroughfares, surmounting hills, trees, and gates, and climbing on to walls and sheds and house roofs—in fact, upon any place whence a glimpse of the proceedings could be obtained. Mr. Spencer ascended from the grounds of Government House, Parel. At the words "Let go," the balloon at once shot up like a rocket amid deafening cheers. When an altitude of 1,760 feet had been reached, Mr. Spencer took the hoop of the parachute in his hand, and flung himself from the balloon. After descending with lightning-like speed for 150 feet the parachute expanded to its full extent, and then gracefully floated down the remainder of the distance, landing the aeronaut safely in the roadway a short distance from the grounds. On his return to the starting place, Mr. Spencer was most enthusiastically welcomed, and everybody crowded round him to give him a hearty shake of the band. Mr. Spencer's parachute was twenty-five feet in diameter, was covered with tough raw flexible silk, and weighed about twenty-eight pounds. It was attached to the balloon by a thin line, the breaking strain of which was eighty pounds. Mr. Spencer's weight is almost double this figure, so that the line broke immediately he threw himself from the balloon.—*The Graphic.*

A Hot Salt Water Well.

A hot water artesian well, at Alma, Mich., is interesting in connection with the notes on the Ponce de Leon well in a late article. A well has just been sunk at the Sanitarium in that city, and on March 22 hot saline water was struck at a depth of 2,876 feet below the surface. The water had a temperature of 156° F. when brought to the surface. The well has 220 feet of 8 inch pipe, and inside this is 560 feet of 6 inch and 1,580 feet of 4 inch pipe, the latter ending in the solid rock. The well has cost $10,000, and will be continued in the hopes of striking gas or oil.



A FRENCH METHOD OF FASTENING CONNECTING ROD KEYS.

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Combination Enlargements.

Supposing it is decided to introduce say a group of figures taken instantaneously on a quarter plate negative into an enlargement from a 5×4, or larger size, landscape negative, the work may be successfully carried out by a method based on that introduced many years ago by Mr. T. Edge for double printing.

In the first place, the figures negative must be dealt with, the figures being carefully stopped out by neatly painting round them for about the eighth of an inch with black varnish. The remainder of the negative is then covered with opaque paper, so that if it were printed from in this state, the figures only would appear on a purely white background. This done, the landscape negative must now be taken in hand, and have small pieces of gum paper fixed on its two sides, and on the top and bottom, to indicate the amount of subject it is desirable to include in the finished picture. This negative is now put into the enlarging lantern, and the image projected on to a piece of very stout cardboard the size the picture is to he—let us say 18×15 inches. The cardboard should be adjusted and fixed in the following manner: Two small French nails are driven into the board of the easel for it to rest upon, whilea third one is driven at the right hand side to serve as a guide, against which it is placed. A couple of drawing pins at the top will hold it securely in position. Now it is manifest that the cardboard can be removed and replaced in exactly the same position as often as may be required; so, of course, could any other rigid substance the same size.

The image is next arranged to size and focused, a bold pencil mark being made exactly where each of the four strips of gum paper are shown. The object of this will be seen hereafter. The image being in focus, the place at which the figures should be introduced is determined upon. They are then roughly sketched on the cardboard the size required. The landscape negative is now removed from the lantern, and the figure one inserted in its place, the size and position of the figures being made to coincide with the pencil sketch when the image is sharply focused.

A piece of bromide paper, 18×15 inches, is next attached to a piece of glass the same size, by means of a few touches of India rubber solution on the back. The lens is now capped and the cardboard removed from the easel and the bromide paper fixed in its place, care being taken that the side of the glass is placed in contact with the register nail. The exposure is then made, and the lens capped with a piece of yellow glass, which, while protecting the image from further action, allows it to be distinctly seen. Of course, if the picture were developed at this stage it would have the figures only with a plain white background. We have now to protect the already exposed portion while the exposure is made for the landscape. This we do by painting it over, while *in situ*, with an opaque pigment—Indian ink for example. This is simply done by tracing over the image as projected through the yellow screen.

The bromide paper and its glass are now removed and placed in the dark, and the cardboard again placed in position. The figure negative is next taken from the lantern, the landscape one introduced, and the size of the image adjusted to its original proportions, known by the gum papers on the negative coinciding with the pencil marks on the cardboard. The lens is then capped and the sensitive paper again made to take the place of the card, the precaution being taken that the side of the plate is pressed close to the guide nail. The second exposure is then made. All that now remains is to wash off the color with water, assisted by a pledget of cotton wool, develop, and fix the picture in the ordinary manner. And, if the work be neatly executed, the juncture of the two negatives will not be perceptible.

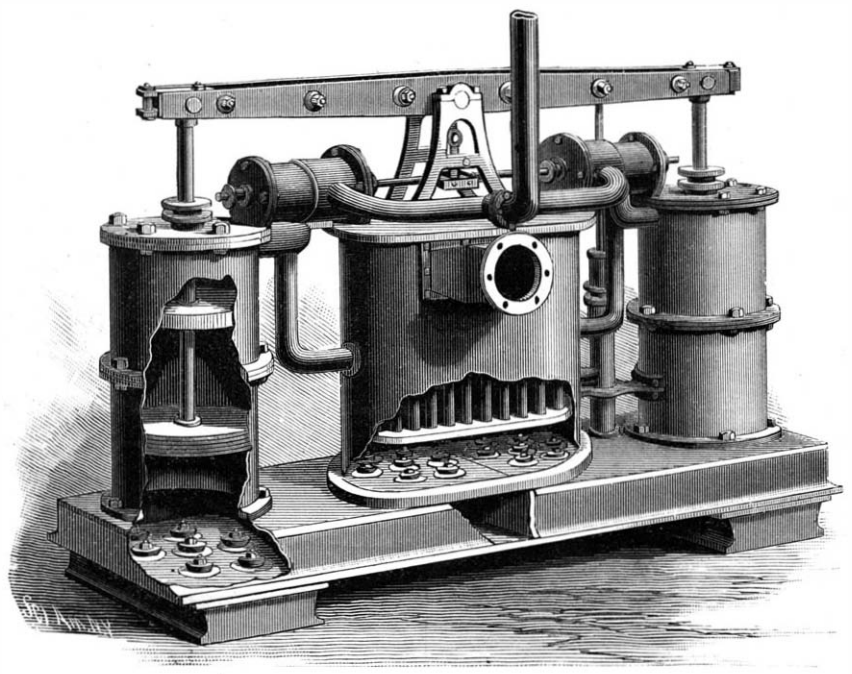
In our first two or three essays the Indian ink was removed completely by the cotton wool, but in some subsequent ones, when using a second sample of paper, a slight stain was left on the surface, but this did not interfere with the development, and in the clearing, fixing, and washing, it disappeared entirely.

There are other methods by which the first exposed image can be protected while the second is impressed. Here is one. After the figure image is focused, take a small piece of bromide paper and expose it and then develop. This picture need not be fixed, only washed and dried. The figures are then cut out neatly by a pair of scissors or a sharp-pointed knife, and used as a shield instead of the pigment. It may be attached to the paper with a touch or two of India rubber solution. The India rubber can be easily removed, when the paper is separated, by gently rubbing with a clean finger.

When a number of enlargements of the same subject are required, this plan of masking will be found more convenient than the painting, as the same figure shield will serve any number of times. The reason why rubber solution is used as a cement is that it causes no expansion in the paper, and is easily removed without injury to the gelatine surface.—*Br. Journal of Photography.*

AN IMPROVED PUMP AND CONDENSER.

The illustration herewith represents a duplex pump and condenser more particularly adapted for marine service, while also useful for other service. It has been patented by Mr. John Reid, of Rio de Janeiro, Brazil, South America. It has a hollow bed divided by a transverse partition into two similar chambers opening to water inlets provided with upwardly opening flap valves, which control the inflow of water to the chambers. At opposite ends of the bed, over the inlets, are two cylinders, the condenser being also supported on the bed between the cylinders. The cylinders are open at their bottoms to the water in the chambers, and the condenser communicates with the chambers controlled by upwardly opening flap valves. The cylinders each have two pistons, held on their respective piston rods, which are connected to the opposite ends of a beam fulcrumed in bearings on pillow blocks mounted on a plate which forms the top of the condenser. The condenser has upper and lower transverse partitions, forming chambers at its bottom and top, these chambers having communication with each other only through a series of pipes or tubes, expanded into the partition plates, the space between these plates around the vertical pipes forming a chamber to receive the steam exhausted from the pumping cylinders. A flanged collar is fixed to the upper part of the condenser, communicating with the upper chamber, and



REID'S DUPLEX PUMP AND CONDENSER.

forms the outlet for the water forced upward through the condenser tubes, while man-hole plates allow of access to the top and bottom parts for purposes of cleaning or repair. Separate steam and exhaust valves are provided for each of the main cylinders, the valves for each cylinder being connected to a stem actuated from the walking beam, and the steam piston valves are larger in diameter than the exhaust valves. The live steam chambers of the valve cylinders have ports which open to opposite ends of a main steam supply pipe common to both valve cylinders, and the exhaust chambers of the valve cylinders have ports which open to the upper ends of pipes which face downward and are fixed to the end walls of the condenser, about midway between its upper and lower tube plates. A pump at one side of the condenser is operated by a rod connected to the walking beam, and discharges the water of condensation from the condenser. For further particulars with reference to this invention address Messrs. J. H. McKinnell & Co., Rio Janeiro, Brazil.

An Ancient Reservoir.

The works which the Gas and Water Company of Tunis are now completing are of exceptional interest from an historical point of view; being nothing less than a restoration of the old covered reservoirs of Carthage, which date back fully 2,000 years. From the description given in *Le Genie Civil*, it appears that these reservoirs form a block measuring 420 feet long by 89 feet 6 inches broad. The interior is divided into eighteen compartments, all of which are in communication with each other and with the incoming and outgoing conduits. During their long existence these cisterns have passed through four periods, alternately of repair and neglect, evidences of which are furnished not only by the different varieties of masonry occurring where repairs have been effected, hut also by the character of the various layers of deposit on the walls of the tanks. The first layer of this deposit is uniform, and corresponds to a considerable lapse of time; that portion which was first deposited is yellowish, becoming whiter as time went on and more care was taken with regard to tbe quality of the water impounded. After the Roman conquest the tanks fell into disuse, and the water in them rapidly became foul; an irregular dark-colored layer being deposited on the sides. The Emperor Adrian repaired the tanks and impounded in them other waters; and during this period a third layer, pure and white as the first, was deposited. But this state of affairs was put an end to by the irruption of the Arabs in 697. Since that time the cisterns have been entirely neglected; and during this period the fourth layer was deposited, which is similar in all respects to the second. Tbe French company have practically revived the scheme of the imperial engineer; and under their auspices the reservoirs will enter upon a new career of usefulness. In cutting through the retaining walls of the cisterns, it was found that these walls were thicker near the ground level than lower down; the reason for this arrangement probably being that the ground was excavated without any arrangement for keeping the sides of the excavation vertical, and the space between the earth slope and the true vertical line was filled in solid with masonry instead of soil.

Magnetic Viscosity.

BY THOMAS T. P. BRUCE WARREN.

When experimenting on the magnetic permeability of oils and other liquids, I found that if a magnetic substance, like soft iron, be covered by different liquids, not only was its susceptibility modified by the permeability of the intervening medium, but distinct evidence was obtained in every case of a molecular stress being produced in the medium, and which indicated itself by a decided tendency of a balanced magnet to stick, as it were, when it was allowed to remain a short time over the soft iron.

The explanation seems to be that the maximum effect of a magnet on soft iron depends on the rapidity with which the medium accommodates itself to the constrained condition necessary for the soft iron to take its greatest degree of magnetization.

As time is an element of importance in attaining a full maximum magnetization from any magnet of a certain intensity, it is not unreasonable to suppose that when a *non*-magnetic medium bas been so constrained by the lines of force passing through it, the molecular stress, which is also favorable to an increased magnetization of the soft iron, will retain the magnet with a slight but decided extra force. I propose to call this extra force, which is due to molecular stress, *viscosity*.

Viscosity is more probably a function of permeability. We have the magnet acting across the medium to the soft iron, and conversely the soft iron reacting through the same medium to the magnet, until the molecular arrangement of the medium accommodates itself to a maximum.

If a galvanometer needle, suspended in the usual way, be forcibly deflected by a current, it is found that the needle regains its fiducial position very slowly. This has been attributed to a crusbing effect on the fibers. This effect has been called viscosity. I do not think it is entirely due to mechanical causes. The term as used in this communication is applied to a very similar phenomenon.

The experimental arrangement was as follows: A balanced horseshoe magnet was suspended from one of the arms of a balance. Immediately under the magnet was placed a shallow specimen glass (salver) with the usual flat glass cover. The cover prevented the magnet being wetted with the liquid, and allowed the attraction to be balanced through a uniform depth of liquid. The soft iron rested on the bottom of the glass.

When the magnet was allowed to rest on the cover for a short time, it reqnired an increased weight being placed in the other pan to pull the magnet off than when the magnet was momentarily in the same position, or only for so long as to restore equilibrium in the balance.

I propose giving some experimental results on a future occasion, and to point out its importance as an adjunct to analytical research.—*Chem. News.*

THE "Julins Pam" diamond, which is valued at from £15,000 to £30,000, has arrived in London from Kimberley. It weighs 241½ carats, or fully 90 carats more than that other beauty, the Porter-Rhodes diamond, and was found in the New Jagersfontein United Mine, of which Mr. Julius Pam is principal owner. It is longish in shape, and of exquisite color—a pure blue white. The only larger diamond in existence is the Imperial, but it is said to be inferior in quality to the "Julius Pam."

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING. — Robert L. Evans, Scottsborough, Ala. This invention covers a novel construction and combination of parts in a coupling designed to be simple and efficient, and which can be readily adapted for use in coupling cars of different heights.

CAR SEAT.—Erik Enequist, Brooklyn, N. Y. This car seat is designed to protect railroad travelers against injury or loss of life in cases of collision, the invention covering a peculiar construction and combination of parts whereby the seats occupy fixed positions under ordinary circumstances, but are caused to swing in case of collision, restraining the occupants from being thrown out or jammed against other seats.

SAFETY LAMP AND STOVE. — Owen Franks and William Carroll, Columbus, Ohio. This stove has a hinged gate and a hinged ash pit bottom, there being below the latter a reservoir containing a fire-extinguishing liquid, and a lever arranged to release the ash pit bottom and grate in case of collision, in combination also with a device for turning down the wicks of the lamps used on the cars to extinguish their flame.

RAILWAY SWITCH.—James B. Suffern, Hillburn, N. Y. Combined with the switch rails and a spring switch stand are two track levers, a slide upon the switch-operating bar, and a system of levers for moving and locking the slide, with other novel features, whereby the train may always be kept upon the main track whether the switch is set for the same or not.

PNEUMATIC CAR PROPULSION.—John T. Clark, La Grange, Ga. This invention covers a system of street car propulsion in which compressed air is conveyed along the track in a pipe having valved outlets with which inlets on the car temporarily communicate in passing to a receiving cylinder in the car, this car reservoir driving an engine between the supply points.

Electrical.

SWITCH STAND FOR DYNAMO STATIONS.—Robert E. Stewart, Dallas, Texas. Combined with outside circuit wires are switch contacts arranged in pairs, there being as many pairs of such contacts as there are dynamos belonging to the circuit, there being also combined with the pairs of contacts correspouding pairs of swinging arms, the arms of each pair being insulated from each other and adapted to engage the contacts of the outside circuit, making a simple switch for introducing dynamos into an electric circuit and removing them therefrom as desired.

Agricultural.

HARROW AND CULTIVATOR.—John C. Bryan, Fordyce, Ark. This invention covers a novel construction in which, by adjusting the cross bars to different angles, the standards will be brought to run closer together and yet the points or shovels will be at all times held at the same angle to the direction of motion.

GRAIN MEASURER. — William McConachie, Belleville, Dakota Ter. This is an attachment for thrashing machines, to automatically measure the grain as it is thrashed and deliver it to a chute which will convey it to a wagon, the invention covering various novel details constituting a simple and effective automatic measurer.

Miscellaneous.

CURTAIN HOLDER.—David D. Nolley and Robert L. Wyatt, Wilson, N. C. This device consists of arm pivoted on the window frame, and provided at its free end with a clamp engaging the curtain, for folding the curtain to one side of the window and holding it in place in folded or closed position.

SUSPENDER HOOK.—Edward F. Paramore, Oconto, Wis. This device is designed to take the place of a suspender button, providing a detachable fastening for suspenders which may be readily attached to and detached from a pair of trousers, the fastening consisting of two parts—a hook and a fastening plate.

BOOK MARK.—Henrietta L. Mehrer, New York City. This book mark consists of two arms connected with each other at one end, a slide held to slide on one of the arms, and a pointer pivoted on the slide, the device being very simple, and indicating the line and word to be marked, as well as the page.

HEAT RADIATOR.—Adam Peart, Corning, N. Y. This radiator consists of a drum formed in sections, and having transverse intersecting air chambers connected with openings in the sides of the drum sections, with dampers movable over the air chamber openings, with other novel features, whereby a great amount of heated air is radiated without sacrificing space.

BILLIARD TABLE.—Charles G. Brockway, Pine Bluff, Ark. The bed of this table has a horizontal bolt hole in which is placed a stationary nut, in combination with a vertically adjustable cushion-carrying rail having a transverse vertical slot, a bolt passing through the slot into the bolt hole and nut, whereby the rail may be adjusted vertically without carrying the bolt and nut with it.

AMALGAMATOR. — Nathan L. Raber, Corvallis, Oregon. This invention provides a simple construction for thoroughly disintegrating the sand, pulp, etc., and flinging them thus separated, particle by particle, into the body of an undisturbed mass of mercury, thereby obtaining the most intimate contact of the precious metals and the mercury and their consequent certain amalgamation.

CARBURETING LAMP.—James P. Magenis, North Adams, Mass. This is a regenerative gas lamp having a hydrocarbon receptacle through which the gas supplied to the burner is passed to enrich it and increase the brilliancy of the light, air being admitted to different portions of the flame to secure perfect combustion and permit of introducing a large proportion of carbon.

FISH HOOK EXTRACTOR. — Ezra L. Post, New York City. This device consists essentially of a two-armed tongs, one arm of which acts as a follower on the line and the other as a disengager for the hook, making a reliable implement for removing a hook from the stomach or gullet of a fish.

ASH PAN AND SIFTER. — James F. Sayer, Gouverneur, N. Y. This is a combined device consisting of two telescoping sections having overlapping screen bottoms, lugs or stops on the sections limiting their extensibility, and an imperforate bottom pan held to the sections to temporarily retain the ashes, being especially adapted for use under the grates of stoves for catching the ashes to be sifted.

HORSE DETACHER.—Charles R. Wilson, Bear Wallow, Ky. This invention provides for the attachment of a singletree of simple construction, and a means whereby the trace straps may be released from connection with the singletree at will by the driver, thereby releasing an unruly animal, and whereby also the traces may be attached without leaving the seat of the vehicle.

VEHICLE SPRING. — William S. and Horace C. Rounds, Townville, Pa. This is an improved spring for side bar vehicles, designed to be simple and durable, and is so made that the body of the vehicle may be hung low, while the spring will be a noiseless one and will communicate an easy motion, free from sudden jerks or jars.

FLUID MEASURING VESSEL. — Thomas E. Armistead, Mazomanie, Wis. This is an improvement in which a pointer is made to move across the face of a dial to indicate the quantity to be measured, whereby a predetermined amount of fluid may be introduced into a measuring receptacle and drawn as desired, without spilling the fluid.

SCIENTIFIC AMERICAN BUILDING EDITION.

APRIL NUMBER.—(No. 42.)

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4. A cottage at East Orange, N. J. Plans and perspective.
5. Page engraving of a stairway in the Chateau de Chantilly. By Mr. H. Daumet.
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7. Engraving of the new station and offices of the Great Indian Peninsular Railway, Bombay.
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12. A residence at Fordham Heights. Cost, thirty-four thousand dollars. Elevation and floor plans.
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14. Designs for wall paper decorations. Flower scroll, designed by A. F. Brophy. Strap ceiling, designed by G. A. Audsley. Arabesque panel decorations, paper for staircases, designed by Lewis F. Day.
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For Sale—Patent No. 399,371, March 12, 1889. Ash sifter. Geo. W. Bown, 1028 So. 3d St., Philadelphia, Pa.

Patent Insulator For Sale—Particularly adapted for arc light wires. Illustrated in SCIENTIFIC AMERICAN of March 30, 1889. Address Warren C. Brown, Tarrytown, N. Y.

Monopolies of novelties For Sale—Address Easter, Station D, Providence, R. I.

Wanted—A first class man for foreman of brass foundry manufacturing plumbing and steam fitting goods. Address, stating terms and references, to box 258, Milwaukee, Wis.

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NEW BOOKS AND PUBLICATIONS.

L'ELECTRICITE A LA MAISON. By Julien Lefevre, Prof. á l'Ecole de Medecin de Nantes. J. B. Bailliere et Fils, Paris, France.

Electricity as employed for domestic purposes is the subject treated of generally in the above work. Our new servant as it is called, which takes the place of lazy and unreliable domestics. Scarcely a new house is erected without being provided with electric wires for "call bells" and for lighting purposes. A number of chapters are devoted to this subject of electric lighting and its accessories—the storage battery, the dynamo, the various forms of lamps, etc. The different kinds of call bell annunciators, etc., are also described at some length, and then the author wanders in other fields, and we find a chapter on the subject of propulsion of boats by means of accumulators. A curious use of electricity is in the shoeing of vicious horses. A current is passed through the bit in the mouth of the animal. After this has been continued for a certain time, it is stopped, and the horse, it is said, is found to be entirely tractable. The work is fully illustrated.

THE PERICOSMIC THEORY OF PHYSICAL EXISTENCE, AND ITS SEQUEL. By George Stearns. Published by the author. 1888. Pp. 338. Price $2.

In this work the theory of the planetary motions, physical force, the earth's orbital motion, and the nebular theory are all considered; and the final application of the author's theory, which gives its name to the work and embodies his views of the phenomena of nature is given in detail.

AN ELEMENTARY TEXT-BOOK OF CHEMISTRY. By William G. Mixter. New York: John Wiley & Sons. Pp. ix, 459. Price $2.50.

This work is designed for use in colleges and schools, and treats of the general laws of chemistry. It gives a very complete view of the bases of the science of inorganic chemistry, is excellently illustrated, and in many respects appears to be a very valuable addition to school literature. It is devoted almost entirely to inorganic chemistry. The illustrations are a very good feature of the work, and the formulæ of chemical equations are given in considerable detail. The atomic theory is considered in a special section at the end of the work.

THE ART OF FRET SAWING AND MARQUETRY CUTTING. A complete guide for amateurs and professionals, containing full and practical instructions for producing and making up marquetry, inlays, and every description of fret work. By David Adamson. Ward, Lock & Co., London and New York. 1888. Pp. 158. Price 75 cents.

This excellent work treats in detail of the popular mechanical amusement that gives it its title. The hand tools, machinery, and materials are considered in the introductory chapters. These are followed by the first lessons in cutting, next by the execution of a piece of real work, while hints for designing come next. Further on, inlaid work, a more difficult modification of the art, is treated at considerable length. The work is well illustrated, and the explanations are clear and concise.

A GENERAL FORMULA FOR THE UNIFORM FLOW OF WATER IN RIVERS AND OTHER CHANNELS. By E. Ganguillet and W. R. Kutter. Translated from the German with numerous additions, including tables, diagrams, and the elements of over 1,200 gaugings of rivers, small channels, and pipes, in English measure, by Rudolph Hering and John C. Trautwine, Jr. New York: John Wiley & Sons. London: E. & F. N. Spon. 1889. Pp. xxiii, 240. Price $4.

This treatise originally appeared in the *Journal* of the Austrian Association of Engineers and Architects in 1869. The volume of the *Journal* containing it has been exhausted by the great demand, and this fact inspired in part the present translation, which has been executed by Rudolph Hering and John C. Trautwine, with numerous additions, and the whole transferred to English measure. The distinction of both authors and translators alone is enough to recommend the work. It is made up largely of tables, and for the hydraulic engineer the work may be pronounced simply indispensable. The amount of labor involved both in the original work and in this translation must have been very great, and seems fully warranted by the high character of the work produced.

A TREATISE ON HYDRAULICS. By Mansfield Merriman, Prof. of Civil Engineering in Lehigh University. New York: John Wiley & Sons. 1889. Pp. vii, 381. Price $3.50.

This excellent work, contributed by a professor of the Lehigh University, treats of the entire theory of the flow of water very fully. Toward the end of the book, after the flowing of water through orifices, channels, tubes, etc., has been treated, current indicators and measures of gauging the flow of rivers, surface curves, back water, etc., are considered. Then comes the dynamic pressure of flowing water, the distinction between static and dynamic impulse being clearly drawn. This introduces the subject of water wheels, direct acting and reaction, including turbine and other water wheels, and the concluding chapter is devoted to naval hydro-mechanics, which briefly considers the subject of the propulsion of boats. A short discussion of the jet propeller is of special interest.

DOSE AND PRICE LABELS OF ALL THE DRUGS AND PREPARATIONS OF THE UNITED STATES PHARMACOPŒIA OF 1880, WITH AN APPENDIX FOR THE USE OF PHARMACISTS, PHYSICIANS, AND STUDENTS. By C. L. Lochman. Philadelphia: Dunlap & Clarke. 1889. Pp. xv, 201. Price, paper cover, $1.25; flexible cloth, $1.50.

This valuable little work contains a series of labels for use by pharmacists, in which each label is given both the Latin and the English title, the general origin of the tincture or drug named, the proportions for the dose or infusion, and a statement of its general action. The labels are so arranged that they can be cut out and pasted upon bottles if desired, the printing being on only one side of the paper. While the bulk of the work is devoted to this, it contains a number of useful tables, and a considerable section devoted to eclectic resinoids and new remedies; an index and a list of German names, with their translation and page reference, end the book. Although it is designed to be cut up, and pasted on bottles, so many valuable references are contained in it that we believe the majority will choose to keep the book intact.

BELL HANGER'S HAND BOOK. With ninety-seven illustrations. By F. B. Badt. Electrician Publishing Company, Chicago. 1889. Pp. 105. Price $1.00.

This work is devoted to electrical bell hanging and gas lighting apparatus. The subject is treated in considerable detail, with numerous illustrations, and is a very practical contribution to a field in which there has been for some time room for such a work.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(594) W. A. R. asks: Is the water on the bottom of a kettle colder than that on top when the water is boiling? A. The water on the bottom is warmest.

(595) W. A. T.—The duties of an electrical engineer involve the planning, erection, and running of electrical installations for lighting, power, propulsion of vehicles and boats, etc. The remuneration varies widely. Positions may be secured with electrical manufacturing companies or at electric light stations, etc. The probability of obtaining a position depends on the man; if willing to begin at the bottom of the ladder, the probability is far greater.

(596) P. B. writes: 1. In copying drawings or plans by the blue print process, does the negative or original drawing have to be made transparent? If so, is castor oil the best? A. Some degree of transparency is required. Castor oil is excellent, and can afterward be removed by soaking and washing the drawing in alcohol. 2. Can you give me instructions for making a dynamo to light two incandescent lamps? I want to use the motor described in the March 17, 1888, number of the SCIENTIFIC AMERICAN, as driving power. Also how many common telegraph batteries will it take to run motor with sufficient speed to run dynamo, the batteries to be about 1 gallon each, and would there be any danger from either of the machines to have them in a room about 15×18 feet? A. Copy the dynamo described in our SUPPLEMENT, No. 600, making it two-thirds the size and using wire two or three numbers smaller. A telegraph battery is quite unsuited for the work. Use forty one-quart bichromate cells. You will work at a great disadvantage in first running a motor and then a dynamo. Primary battery lighting is very expensive; if it must be used, the lamp circuit should be connected directly to the battery without a motor and dynamo intervening. There is no danger from either of the machines.

(597) F. H. asks: 1. Please give me directions for making a dry battery of sufficient power to generate a perceptible electric current. A. Make a jelly with glue, water, and sulphuric acid, fill the vessel, and while hot immerse in it the plates. This will soon polarize; a little bichromate of potash may advantageously be mixed with it. 2. Can a dry battery be attached to an electric belt and be more effective than the solution process of charging an electric belt? A. A dry battery will be less effective than a wet one. 3. How do you detect an electric current, when it has not sufficient strength to be perceptible? A. By a sensitive galvanometer.

(598) J. N. P.—For best Babbitt metal, use 1 part copper, 6 parts tin, 2 parts antimony, by weight. Melt the copper in a crucible, add gradually one-half of the tin, then the antimony, and finish it by adding the balance of the tin. Let the temperature gradually fall as you add the tin; pour in bar moulds of iron.

(599) A. J. R. asks the best way to etch names and designs in steel tools, etc., and the name of some good work on same. A. For etching on cutlery and tools see Notes and Queries, No. 21, April 23, 1887, in SCIENTIFIC AMERICAN. Also for a general treatise on etching, see Spons' "Workshop Receipts," 1st series, which we can mail for $2.

(600) Omega asks (1) for the explosive force of gasoline when vaporized, or have you any book on such a subject in reference to gas engines? A. You will find gas engines treated in the following works: "Clark on the Gas Engine," $2. "Goodeve on the Gas Engine," $1. "MacGregor on the Gas Engine," $3.40. Gasoline mixed with air and exploded would give for an instant quite a high pressure, 50 or 100 pounds to the square inch. 2. Also do you know of any successful burner for burning crude oil under a submerged tubular boiler in a small launch, boiler 44 inches high, 32 inches diameter? A. For petroleum burners address some of our advertisers, builders of steam engines, boilers, etc.

(601) G. M. S. writes: There is a paint made for shingle roofs, of which the principal ingredients are coal tar, gypsum, benzine, and coloring; it is applied cold and dries quickly. A. One barrel coal tar, ten pounds asphaltum, ten pounds ground slate, two gallons dead oil. Add the dead oil after the others have been mixed by aid of heat.

(602) H. W. T. asks for books on etching, gelatine process, etc. A. We can supply you with "Zinc Etching," by Gast, $1.00. "Zincography," by Bock, $1.00. "Photo-Engraving; All about It," $3.00. "Electrotyping," by Urqnhart, $2. "Photo-Mechanical Printing Processes," by Burton, $1.50.

(603) J. P. F. writes: I am desirous to get some information in regard to low pressure steam heating. What book can you recommend, treating of this class of work? A. We recommend the following works: Baldwin, "Steam Heating," $2.50; Schuman, "Steam Heating," $1.50, which we supply by mail at prices stated.

(604) P. F. F. asks if there is any kind of liquid that will clean the hands after dyeing cotton goods. A. It depends on the dye; as a rule, whatever you use will affect the skin. Acids or alkalies will destroy many mineral dyes; orgauic colors are not easily removed. Washing with alcohol is sometimes effectual.

(605) A. L. T. says: 1. I have made a simple electric motor as described about a year ago in the SCIENTIFIC AMERICAN, and with eight bichromate cells it runs two sewing machines. Now I wish to apply the motor to a lathe which I now run by foot power. The lathe is back-geared and screw-cutting, and I do light work only on it. Is the motor of sufficient power to do the work either with the back gears or simple turning, provided I have enough electro-motive force? A. The motor is of sufficient power to do the average work of a foot lathe, but it is not large enough to do all the work that can be done upon a lathe by the foot, as it is able to develop only about one-eighth horse power, whereas a man by extra exertion can momentarily develop one horse power. 2. Would it be possible to increase the power of the motor, by a larger amount of wire on the field magnets or making the field magnets larger and putting on double amount of wire? As the armature was quite difficult to make, I would like in some way to make a more powerful motor (if this is not strong enough to run the lathe), using the armature which I have already made. A. The change of the field magnet would not improve the motor. By increasing your battery power and running your motor a little faster, and reducing the speed by proper gearing, you will be able to run your lathe. 3. I am thinking of getting storage batteries to do the work. How many would I need? (I think they are each 2 volts E. M. F.) A. About 8 cells. 4. Would it be safe to charge them from an arc light circuit (the circuit is a divided one with about 6½ amperes, and of course I would have a switch and ammeter as recommended by the electric light company). A. Yes; but they should be placed in a shunt. 5. Do you know how many amperes the motor requires, and also how much it would stand without burning out the armature? A. If the armature and field magnet of the motor are connected up in parallel, the motor will bear a current of about 16 amperes. 6. Could I safely put it in a shunt of an arc light circuit, although the storage batteries would be better, as I could only get direct power at night? A. Yes.

(606) J. W. D. asks (1) if the shafts of the glass disks in an induction Wimshurst electric machine could be made in one piece, passing from one support to the other, and with holes made in the glass for it to pass through. Would it hinder the making of electricity? A. The shaft of a Wimshurst machine must necessarily be made in two pieces, because the glass disks must revolve in opposite directions. You could make the central part of the rod, upon which the tubular shafts are supported, of insulating material, and allow the rod to run straight through the machine, if desirable. 2. Would it be safe to make the holes in the glass by making a pile of wet clay in the center, making a hole in the clay the size desired down to the glass, and pouring in melted lead, or would it crack the glass? A. Your proposed method of making holes in glass would be unsuccessful—it would break the glass. To cut a hole through a plate of glass, employ a copper tube arranged to run in a wooden guide, and supply the tube with a mixture of rather coarse emery and water while it is revolved by means of a drill bow or by attachment to a hand drill.

(607) D. W. writes: In making simple electric motor I have placed a piece of brass tubing on a hard rubber cylinder for a commutator. Now, will that work, or should it have been of copper tubing? A. Copper is better than brass for a commutator. 2. In winding the field magnets I commenced to wind from the inside instead of the outside. Will you please tell me how to connect the wires? A. Connect corresponding ends of the wires of the field magnet. You can readily test the magnet to see whether the current passes in the right direction through both legs of the magnet, by holding an ordinary pocket compass near one pole and then near the other. One pole should indicate north polarity and the other south. 3. Is there any way of making a battery in the shape of a wooden box divided into small sections, and coated with something to prevent leakage or destruction by the acid? A. A battery cell can be made of wood, but it is apt to check and leak. Asphalt forms a good acid-proof coating for wood.

(608) W. L. writes: I work in a flock mill where it is very dusty. The flock or stock is about the size and weight of coarse sawdust. Could the stock be taken up by a fan and run into an air tight room where the dust could settle and not be lost? A. The dust in the room may be removed by an exhaust fan and thrown into a room lined with muslin on frames, so arranged as to make a space of two or three feet all around. The dust to be injected within the muslin room allowing the air to escape through the muslin to the outer space. The dust will gradually accumulate on the inside of the muslin and choke the ventilation, when the fan may be stopped and the dust whipped off by striking the muslin from the outside. This will save the dust. If it is not wanted for flock, it can be precipitated under water by high speed blower and dried in cakes for paper stock or other uses. If the whole flock and dust is to be removed together, a Sturtevant exhaust blower should be used and connected with a much larger muslin room than for the floating dust alone.

(609) J. R. asks: 1. Could a magnet be affected by a bar of steel completely inclosed in a brass cylinder one-sixteenth of an inch thick? A. Yes. Brass is not an insulator of magnetism. 2. From what distance would a magnet with a face two inches by one-half inch attract particles of steel? A. Theoretically, it would affect particles of steel at almost any distance. The distance through which a magnet is able to move particles of steel depends, of course, upon the size of the particles and the strength of the magnet.

(610) O. O. O. writes: Please tell me what I can do to increase the power of my battery, a Leclanche prism of three jars or cells. I have added new sal-ammoniac and zincs, but the power is no better. What is the right amount of sal-ammoniac to use? The carbons and prisms look all right; how can I test them? Is soft or rain water necessary? Will water that has been boiled do? Does too much sal-ammoniac decrease the power of the battery? A. Use a saturated solution of sal-ammoniac in your battery. Soft water is preferable for dissolving the sal-ammoniac, but any water will answer. If your battery has been long in use, it is possible that the prisms are exhausted and new ones may be required. Your zincs should be clean and well amalgamated.

(611) C. K. writes: Twice I think I have read in the SCIENTIFIC AMERICAN that an emulsion of oil and gum tragacanth can be made. Will you kindly let me know how it can be done, also if it would be water-soluble? An extract firm claims to have a soluble oil of lemon, and I think it must be made on the above plan. If this is so, it would save bottlers quite a sum every year for cologne spirits, as we use from 8 to 16 ounces alcohol for each ounce oil. A. An emulsion is properly a mixture of oil or other liquid with another liquid in which it is insoluble, but in which it is kept in suspension. The role of gum tragacanth or similar substances in emulsions is not to render the oil soluble, but to thicken the water, so that it will hold the oil in suspension in small globules, or vesicles. We do not know anything about the oil of lemons you refer to, but if truly soluble, it is doubtless not an emulsion.

(612) J. D. L. asks the best method of coating iron water pipes so that they will not rust, the coating not to render the water unsuitable for drinking. A. There is no way of coating the inside of water pipe in an amateur way that is satisfactory. Coal tar and asphalt are much used by the manufacturers of pipe, which are applied by dipping the heated pipe into a trough of melted tar and asphalt, mixed to make a tough coating. Such pipe will flavor the water for awhile, but makes the next best substitute for galvanizing. The galvanized or zinc coated pipe is the best and most durable pipe now in use for conveying cold water.

(613) O. F. P.—Chilled castings can only be softened by annealing for from two to eight hours, according to size or depth of chill, at a red heat. Pack the castings in pulverized charcoal and fine ashes closely in an iron box, heat slowly to a red heat in any convenient fire with enough fire to last several hours. Cover the whole with ashes or cinders, so as to continue the heat the required time and gradually cool.

(614) J. T. asks how to kill weeds on a cinder running track. A. Sprinkle the track with strong solution of soda or bleaching powder in water. Salt is also efficacious if applied thickly enough.

(615) C. H. T. asks: What is best—the most durable—to paint galvanized iron with? A. If a heavy under coat is required, use a metallic paint in boiled oil, dry well, and rub smooth before putting on the gilding coat.

(616) F. D. S.—We do not recommend petroleum for ordinary hot water heater, or for house heating, nor for any steam generating furnace where it cannot have a constant personal supervision. Its use for fuel without steam under pressure for atomizing has not yet proved a success. For the methods of application see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 403, 623, 624.

(617) G. McL.—For illustrated descriptions of incubators, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54, 425, 380.

(618) G. S. & Co.—The iron putty used for steam joints is made by mixing dry 2 parts of a good metallic paint, 1 part litharge, 3 parts fine iron borings sifted, or for close joints, iron filings. Add boiled linseed oil and mix to the consistence of stiff putty.

(619) H. G. asks why he cannot make quicksilver amalgam stick to glass so as to silver it. A. We presume your manipulation is defective. Lay a piece of tin foil (not lead foil) on a smooth flat surface and pour mercury over it to a depth of one-sixteenth or one-eighth inch. Slide the perfectly clean glass plate over it, with its advancing edge just below the surface of the mercury, so as to bring a new surface of amalgam against the glass. Then leave the glass for awhile under pressure, as of a few books, and finally place it on edge to drain.

(620) C. F. K. asks for an article to use for repairing mirrors or silvering looking glasses where they have been scratched, or the quicksilver has been scraped off. A. Place some quicksilver on a piece of broken looking glass. Then with a knife you can slide off a piece of amalgam and transfer it to the other glass, which should be placed in a horizontal position. See preceding query.

(621) N. K. H. writes: I want to build a furnace of brick, one where the fire will be next to the wall. What is the best to use—lime, cement, or fire clay? A. Use fire brick only, and lay with fire clay mixed with equal parts of finely ground fire brick. You can buy material for the fire mortar already mixed, through the fire brick trade.

(622) B. C. asks for some way of turning brass black so it will not rub off. A. For black, blue, or steel color on brass, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 535.

(623) T. G. R. asks: If I get a blacksmith to make me the magnets for the Desprez galvanometer, will common tool steel do, or does it require to be the finest steel, and what width would it require to be, and would the magnets require to be hardened all through or only on the ends? A. Tool steel, or even some kinds of machinery steel, will answer for the magnet. It is sufficient to harden the steel at the ends. 2. Is the tapering spring (secured to block on the base) of steel or spring brass? A. The spring may be of either steel or brass. 3. Will angle plates do, made of either steel or brass? A. They should be made of brass. 4. Should the No. 40 silk-covered copper wire be single, double, or triple covered, and about how many layers should there be to make the right thickness? A. A quantity of single covered wire will answer; six or eight layers of the wire will be sufficient. 5. Should the upper hook be connected to the outside end of the coil or the inside end? A. It is immaterial which end of the coil is connected with the hook. 6. Should one each of the mica plates be on the top of coil and the other underneath the top, or should both be on the top? A. You might place one mica plate within the coil and the other on top. 7. Also how to find the focus of mirror? A. Hold the mirror in front of an open window and reflect the light upon the window casing. Move the mirror back and forth until an image of the objects outside of the window appear on the mirror. The distance between the mirror and the casing will be the focus of the mirror.

(624) E. J. E. asks: Can you give receipt for making a plain cotton, woolen cloth or fine chamois skin water proof, and still have it retain its natural softness? A. Try treatment with paraffine applied hot, and worked in with a hot iron.

(625) W. M. C. asks whether fresh water on narrow beaches is filtered salt, or how it comes. Why does the water in wells on beaches rise and fall with the tide, and when the salt water breaks over the beaches into the wells, what becomes of the salt, as they immediately freshen? A. The fresh water springs on beaches are derived from sources independent of the sea water; any salt water that breaks over them sinks quickly into the ground or runs away. They may vary their rate of flow with the tide without any mixing taking place if there is a constant outflow of fresh water, as then it will keep the salt water back under all circumstances.

(626) C. McE. asks: Will you kindly let me know through the SCIENTIFIC AMERICAN if the "Simple Electric Motor," in SCI. AM. SUPPLEMENT, No. 641, can be run by, say, five or six cells of Fuller mercury bichromate battery? Or if the motor can be run by any other battery than one of the plunging type? A. The motor can be run by the Fuller, Bunsen, or Grove battery, but it will require a greater number of cells. If you desire to use the Fuller bichromate battery, use about twenty cells, connecting them ten in series and two in parallel.

(627) H. T. asks: 1. Is the electro-magnet described on page 214 of April 7, 1888, strong enough to deflect the flame of a candle? If so, how many batteries of the Grenet form would be necessary? If not strong enough, would you give size of magnet, with size and amount of wire, and also number of cells of bichromate batteries necessary for the purpose? A. Yes. Use sixcells of Grenet battery, having plates 3 by 6. 2. Is a magnet built up of strips of hoop iron preferable to one forged out of soft iron? A. The principal advantage in hoop iron is that the magnet may be constructed without the aid of a blacksmith. 3. What is supposed to be the cause of the so-called para-magnetic phenomena? Is it something aside from ordinary electricity, or what? A. We do not know that this has ever been satisfactorily settled. 4. In the induction coil the length of the spark produced will depend upon the length of wire used in the primary coil, and in the length of wire used in the secondary coil, of the size of the iron core and of the number and dimensions of the batteries used; the question is: What effect is produced on the character of the spark, other than length, such as thickness, intensity, or other quality, by employing different thicknesses (that is, heavier or lighter) of wire in the construction of the primary coil, and also of the secondary coil? A. The intensity and quantity of the secondary current is related in some degree to the sectional area of the wires of the respective coils. When a heavy primary and light secondary coil are employed, a long thin spark will be the result; when a fine primary coil formed of a great length of wire is used in connection with a short, coarse secondary coil, the secondary current will have great quantity and small intensity.

(628) J. G. writes: I have studied chemistry for about six months, picking out the things I could not understand, so as to be enlightened by some friend better posted on the subject. Among my many difficulties the following stands prominently forth: Hydrofluosilicic acid, SiH_2F_6. Is this a chemical molecule? I have consulted four standard authorities; in each I find the formula as given. If chemists are to be believed, how can eight monads satisfy one tetrad? A. You are committing the error of all beginners in interpreting science too rigidly. There are molecular affinities, and this compound is built up from three saturated molecules, HF, HF, and SiF_4. This is proved by the fact that on boiling it is decomposed into hydrofluoric acid, HF, and silicon fluoride, SiF_4.

(629) J. R. asks how twenty-two caliber cartridges are loaded, and how to reload them; want to use shot instead of bullet. A. Fulminate of mercury may be used as a primer, secured in place by gum or glue, and ordinary powder, wads, and shot may be used. There will be very little room for the charge, which must be a light one. The shell is too small for shot, and it will hardly pay to reload them.

(630) O. J. asks whether there exists any waterproof cement, which will unite rubber and porcelain? A. Use bicycle tire cement, or try a mixture of Burgundy pitch or asphalt and gutta percha melted together.

(631) G. M. writes: 1. Referring to the article on capillary force figured and described in SCIENTIFIC AMERICAN of January 19, I would like to ask how high is it possible to raise water in one end of the trough above the other end, and how low it is possible to depress the mercury, and is there any other substance that will show a greater range above and below than water and mercury do in the experiments given? A. Water and mercury will have practically about as high range as any fluids; without being of infinitesimal thickness, one or two inches elevation and depression could be reached. 2. How thick should a cylinder be to withstand a pressure of 650 lb., the cylinder to be 6 inches in diameter, 12 inches long, with the cylinder heads bolted on? The material to be steel. A. 1-10 inch. 3. In the SCIENTIFIC AMERICAN Reference Book, page 119, we read that charcoal will absorb 80 or 90 times its own bulk of some gases. Please name several gases that charcoal will absorb in such quantities? A. Carbonic acid gas, ammonia, and many others. 4. How can the charcoal be quickly discharged of the gases which it absorbs? If by heat, please state about what temperature is necessary to free the char-

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coal of the gas, and is there any other way besides using heat? A. By a heat verging on redness. There is no other rapid way of removing the gas. It might be done slowly by absorption by chemicals, such as slaked lime, caustic soda, etc. 5. About how long will it take the charcoal to absorb the gas, and how long to free it of the gas? A. A few seconds to one minute.

(632) J. P. writes: You gave a recipe for artificial honey in SCI. AM., December 8, 1888, page 363, query 26, in that you say 80 grains cream tartar. Please state how many grains to a pound or to an ounce of 16 ounces to the pound? Also, will it keep any length of time with the whites of eggs in it? A. There are 7,000 grains in a pound avoirdupois, or 437½ grains in an ounce. It will not keep well if made with whites of eggs.

(633) J. E. O. writes: Physiologists tell us that an image when received on the retina of the eye is inverted; but few give any satisfactory explanation why we see all images righted. It is claimed by some that the brain receives the image inverted, and our judgment rights it. Will you please give us your opinion? A. The connection between the brain and the outside world cannot be traced. A specific image produced on the retina affects the brain with the sensation of sight; the inversion of the image is immaterial to the question, as the question transcends mechanics or physics.

(634) J. C. M. writes: An aquarium of mine, made of marble and glass, leaks at the joints. Please tell me in the Notes and Queries column of the SCIENTIFIC AMERICAN how to make a cement to mend it with? A. Try litharge and glycerine, or melt in Burgundy pitch and gutta percha cement (see Queries 630 and 641) with a hot iron when the glass and marble are perfectly dry.

(635) F. S. W. asks: How many cubic feet of ordinary illuminating gas are required to equal one ton of ordinary Pennsylvania pea coal for steam, when burned under a boiler? What effect has a gas jet on the iron of the boiler compared with a coal fire? A. 50 to 70 lb. of coal are considered equal to 1,000 cubic feet of gas in heating power. The gas may be burned from long pipes with numerous perforations, preferably arranged with air injector burners, as the least production of lamp black indicates inefficiency. For cost and exact details consult an engineer.

(636) J. C. asks: 1. How to make paper out of rags? A. For paper making we refer you to Davis' work on paper making, $6; Cross, Bevan and Joynson on paper making, $4. 2. Do the clouds move, or is it the earth turning on its axis that gives them the appearance of moving? A. The clouds move, dissolve, and reform again continually; their motion and changes are real.

(637) F. A. asks how wood can be electro-plated with copper? The object I desire to plate is the ebony handle of a surgical knife. A. First rub the wood with hot paraffine; coat it with a thin coating of plumbago, applied with a brush, and then submit it to the regular electro-plating process.

(638) E. W. M. writes: In testing gas meter, there are five cubic feet pass through the test meter, while six cubic feet pass through the meter to be tested; is the meter to be tested 16⅔ per cent fast or 20 per cent fast, or in other words, what is the divisor—five or six? A. The meter is 20 per cent fast. If gas were one dollar a thousand, you would by such a meter pay $1.20 for $1 worth of gas. The correct figure always should represent 100 per cent.

(639) L. S. M. writes: Can you inform me of any acid or other substance which will rapidly putrefy and liquefy the flesh of crustaceans so that it may be removed through a small aperture, and which will not affect the shell in any way? The intention is to preserve the shell intact in its natural color, and I am looking for some way to remove the flesh without disintegrating the shell? A. Try caustic soda solution; you must experiment, using different strengths of solution and various temperatures. You may have trouble from the disintegration of the ligaments connecting the segments. You might try the old receipt of placing them near ant hills, in order that the ants may clean them.

(640) E. LeR. S. asks: In speaking of a mile on land between two points, is there any difference between the English and American mile? A. There is no difference; the distance is 5,280 feet.

(641) W. McB.—If no heat is to be applied to your glass-lined acid vat, we would recommend some such cement as bicycle tire cement. The following is recommended for making wood watertight and proof against sulphate of copper, but not against cyanides:

Burgundy pitch	1,500 parts.
Old gutta percha in fine shreds	250 "
Finely powdered pumice stone	750 "

First melt the gutta percha and mix with the pumice stone and then add the pitch. Apply hot, using a soldering iron. For resisting heat and acids the following is recommended:

Sulphur	100 parts.
Tallow	2 "
Resin	2 "

(642) L. K. S. asks for the names and price of the most complete work on chemistry of glass. Also name of firm supplying such books? A. We can supply you with Feuchtwanger, Water Glass, $5. Shenstone on Glass Blowing, 80 cents. Powell, Chance and Harris on Glass Making, $1.50. The first named is devoted to silicate of soda, and not to glass in general.

(643) J. L. asks for gold size for gilding on wood so as to obtain a bright finish, resembling burnished finish. A. Waterproof gold size is prepared from half a pound of linseed oil with two ounces of gum animi, the latter is reduced to powder and gradually added to the oil while being heated in a flask, stirring after every addition until the whole is dissolved; the mixture is boiled until a small quantity, when taken out, is somewhat thicker than tar, and the whole is strained through a coarse cloth. When used, it must be ground with as much vermilion as will render it opaque, and at the same time be diluted with oil of turpentine, so as to make it work freely with the pencil. This does not give a burnished finish. For burnishing a mixture of American bole, a little wax and parchment size is used. The latter is made by boiling parchment scraps in water. We refer you to "Workshop Receipts," first series, which we can supply free by mail for $2, for a very elaborate account of gilding operations.

(644) T. A. McC. writes: In a tunnel 1,600 feet long will a ten foot pressure of water force out earth and rock that readily dissolves when exposed to the atmosphere, in a few weeks? The tunnel has a total fall of some two feet. A thousand feet of the tunnel is through this shelving rock which readily dissolves when exposed to the atmosphere, and has so caved in that it will not permit the water to pass through. Tunnel is 6×6 feet. By means of a flume we can pour the water in some ten feet above the floor of the tunnel, and we want to know if the water will force its way through and wash out the debris? A. If you can supply a full stream of water at 10 feet head, you can wash the dirt and gravel through the tunnel, if not entirely obstructed. After an opening is obtained, a volume of water will be required to give a velocity of 4 feet per second through the obstructed part for carrying forward the broken stone which would be deposited in the unobstructed part of the tunnel. To remove this, a volume equal to the whole area of the tunnel, or 144 cubic feet of water per second, would be required to entirely clear it from sand, gravel and small broken stones. The large rocks would require other means for removal.

(645) W. W. T. writes: I have made a glycerine barometer, using a pint tin can with two necks, in one of which I insert a barometer tube open at both ends, bore 0·25 inch, and in the other a thermometer to make corrections for temperature. All fittings and seams are air tight. While it very often agrees with the signal service barometrical readings, sometimes there is a difference, for which I can find no cause. Please tell me the reason. A. The barometer tube should be closed at the upper end, and should be of such height, about 25 feet, that a vacuum will be left above the fluid. The liquid in the tank should be in some kind of communication with the air. You may insert a tube through the cover of the tin can and tie an India rubber balloon over it. In the SCIENTIFIC AMERICAN of December 25, 1886, you will find described a glycerine barometer.

(646) B. O. L. writes: When the phonograph is talking can it be heard all over the room by the entire audience if the voice talked into it was loud enough, or must a person have ear to receiver in order to hear anything? Can only one hear at a time? A. An ear tube is required. If several are provided, as many persons can listen as there are tubes. It cannot be heard all over the room.

(647) H. S. H. writes: There has been some discussion on the subject of "parks," in a literary club here, at which it was stated the park at Versailles, France, was the largest artificial park in the world. A few of us had some doubts of it, and I write to you as the surest way to settle the question. If Versailles has not the largest park, can you tell me where it is and how many acres it contains? A. The park at Versailles is not remarkable for size, but rather for its water works and buildings. The following are representative parks of the world, with their acreage:

Fontainebleau	21,000 acres.
Boulogne	2,500 "
Vincennes	2,275 "
Windsor	3,800 "
Richmond	2,253 "
Fairmount	2,740 "

(648) C. F. P. asks how to test the purity of drinking water with permanganate of potash. I wish to test an open well for any organic matter which it may contain. A. Dissolve 2 grains permanganate of potash in 10½ ounces distilled water. 10 drops of this represent 1-1000 grain of oxygen. Add it to the water drop by drop until a faint pink color is produced which is permanent. The number of drops per gallon represents the amount of oxygen required to oxidize the organic matter. It should not exceed 0·2 grain per gallon. The test should be executed by a chemist, and at best is a mere approximation and may condemn a water that is perfectly healthy. It has only confirmatory value.

(649) H. McC. writes: An advantage claimed for Mercator's projection reads, "The true shapes of continents are given, although expanded toward the poles. If the last statement is true, the first (in my eyes) cannot be true. Kindly explain. A. It is not strictly true. As the poles are approached the lateral distances become magnified, so that only a general accordance of shape is preserved.

(650) G. F. R. writes: Will you kindly let me know through your paper whether theoretically it would weaken the current passing through a conductor if a magnetic needle is placed under it? A. It would not.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the numbers therein given:

(403) T. H. DeS.—Radiator, Coal, etc.—1. A steam radiator is more efficient at the higher pressure by the difference in the temperature of the steam at both pressures. 2. The Jellico mountain coal ordinarily has 60 parts fixed carbon, 36 parts volatile matter or gas=to 96 parts combustible in 100. The cannel coal from the Jellico upper bed has 35 parts fixed carbon, 50 parts volatile matter=85 parts combustible in 100. We have no record of any true cannel coal in Alabama. The Cahaba and Corona beds have from 50 to 55 parts fixed carbon to 41 parts volatile matter; or 91 to 96 parts combustible in 100. The nearest to a semi-bituminous or semi-anthracite are: The Deer Creek mines, which have 68 parts fixed carbon and 22 parts volatile, or 90 combustible in 100. The steaming qualities of these coals as compared with Cumberland, 100, are as follows: Jellico 90·7, Cahaba 93·2, Corona 93·0, Deer Creek 89. 3. A direct connection with vertical pump is best and cheapest. A long-stroke crank connection with engine by belt is much used and preferred for constant and heavy work, as for very deep wells. 4. Bones that have grease or carbonaceous matter in them will enrich ordinary coal gas and add to its volume. Gas made from grease or oil is heavier than ordinary coal gas, containing more carbon.

☞ Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

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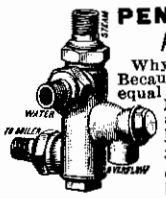

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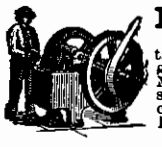

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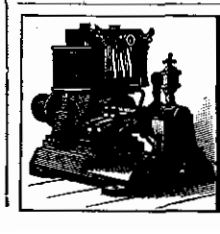

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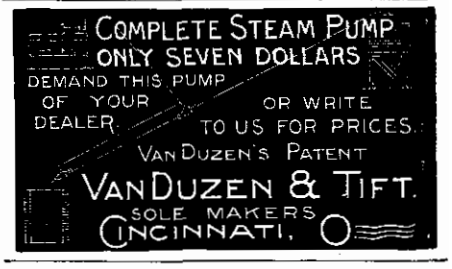

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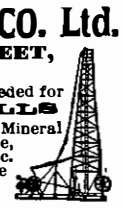

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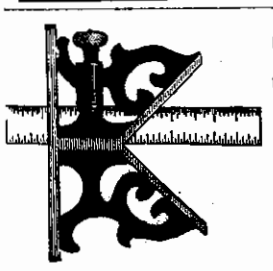

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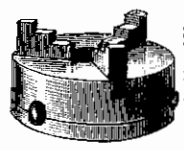

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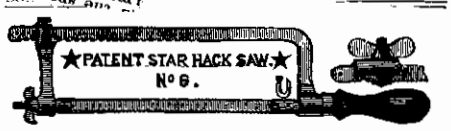

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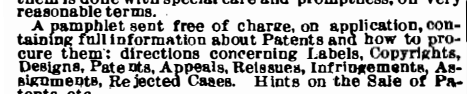

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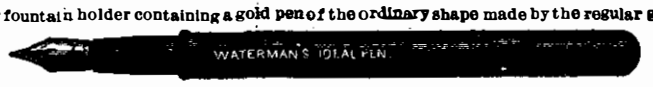

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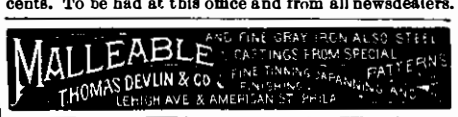

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